July 2004

City of Redmond

Hazard Mitigation Plan

Document Three:

HAZARD MITIGATION PLAN

HAZARDS MITIGATION PLAN

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EXECUTIVE SUMMARY

The City of Redmond can utilize Hazard Mitigation Strategies to create a sustainable society resilient to natural and manmade hazards. Hazards can result in the disruption of entire communities, persisting long after the causative event itself and exceeding the community's ability to recover unaided. The impacts of natural hazards can, at a minimum, be mitigated or, in some instances, prevented entirely. The City of Redmond is vulnerable to a variety of hazards, including earthquakes, severe winter storms, flooding, landslides, and terrorism. The degree of risk, resulting from the occurrence of one or more of these hazards, is determined by the nature of the hazard and what is vulnerable.

Ground shaking from a major earthquake would likely result in widespread damage to single-family homes and small businesses. Damage to utilities and the transportation infrastructure could also occur. However, earthquakes are only one of the hazards that could threaten the City and its residents. Redmond is home to some of the most recognizable corporate giants in the nation, including Nintendo, AT&T, and Microsoft. These corporations, as well as the Olympic Pipeline, may be vulnerable to terrorist attacks. Hazards can affect Redmond not only at the local level, but the regional level as well. Redmond is highly vulnerable to isolation especially during a regional event. During a regional event, mutual aid agreements and outside assistance may be largely unavailable, leaving the City to care entirely for itself.

This document identifies the Goals and Objectives that provide overall direction for the planning effort and offer mitigation items to reduce risks over the long term. This project began with a Hazard Identification and Vulnerability Analysis (HIVA) that was completed by University of Washington graduate students in June 2001. The purpose of that document was to: (1) Provide a basic level of knowledge and initial analysis of the risks facing the City of Redmond; and (2) Serve as the basis for the City of Redmond to initiate the Mitigation Planning Process and support the City's overall risk reduction effort.

Based on the information contained in the HIVA, additional research, and feedback from the City of Redmond, local business owners, and residents, the team produced a Multi-Hazard Mitigation Plan Proposal for the City of Redmond in March 2002. That document contained a comprehensive set of issues that were identified based on the foreseeable hazards, and the vulnerabilities associated with those hazards.

This document, Hazards Mitigation Plan for the City of Redmond, is the third stage in the Hazard Mitigation Planning Process. As a part of this planning process goals were developed to guild the planning process form information gathered through focus group sessions, one-on-one interviews, literature reviews, and team planning sessions. Based on feedback from the City of Redmond, local business owners, residents, and additional research, Objectives were identified and specific actions items were developed.

All action items generated in this project were designed to achieve these goals and objectives.

Of all the actions identified in this report, ten priority items are summarized below. These top ten action items were selected based on guidance from City leaders, the effectiveness of the strategy at reducing vulnerability, and the comprehensive mitigation achieved by implementation.

1. Develop alternative emergency government operations capabilities outside of high-risk areas

2. Partner with King County, neighboring jurisdictions, and WSDOT to harden transportation routes
3. Strengthen relationships between corporations and vendors, including provisions for emergency operations centers and mutual aid
4. Reduce risk to the Olympic Pipeline and surrounding areas
5. Implement neighborhood-targeted risk reduction programs
6. Design events promoting business continuity
7. Adopt a post-disaster recovery plan for Old Town
8. Retrofit historic district structures
9. Support regional mitigation initiatives
10. Enhance existing GIS capabilities emphasizing hazard analysis

The primary focus of this document is mitigation, which is "any sustained action that reduces or eliminates long-term risk to people and property from natural hazards and their effects." The document focuses on goals and objectives that reduce the level of risk where possible, thereby limiting the need for preparedness. Where mitigation is not feasible or until an acceptable level of mitigation can be achieved, the report offers action items that focus on preparedness and response.

The goals and objectives stated in this document were driven by the visions stated in the City of Redmond Comprehensive Plan, and they are consistent with those statements. The report also includes ways the City can capitalize on the recovery opportunities presented following a disaster.

The City will include these actions in future post disaster recovery efforts resulting in a safer, more resilient community.

INTRODUCTION

Background

The City of Redmond is the sixteenth largest city in Washington State, with a residential population of more than 45,000 people. It encompasses an area of over 16 square miles and is located less than 20 miles east of downtown Seattle at the north end of Lake Sammamish. The City takes pride in its high quality of life with good schools, a healthy economic base, a parks system that provides a variety of recreational opportunities, diverse offerings for shopping and dining, safe neighborhoods, and an emphasis on quality development and protection of the natural environment.

The City is a well-known center of technology and is home to a number of nationally and internationally known high-tech and biomedical companies. Among these are Microsoft, Nintendo, AT&T Wireless, Spacelabs Medical, and Medtronic Physio-Control. Redmond Town Center, a large downtown retail center, offers numerous shops, restaurants, an eight-screen movie theater, special events, and live theatre performances. As Redmond continues to evolve into a thriving City of increasing diversity, it seeks to promote its sense of community through programs designed to celebrate its heritage, enhance its neighborhoods, and preserve its historical and natural treasures. In keeping with the desire to preserve its small town feel and protect the livelihood and safety of its citizens, the City of Redmond has partnered with the University of Washington to create a more disaster-resilient community through the creation of a Hazard Mitigation Plan for the City of Redmond.

Hazard Mitigation Planning has become an increasingly important element in Planning, especially in the Seattle area where natural and human-made hazards threaten the livelihood of all who live in the region. The City of Redmond has experienced a variety of hazard events in the past, such as earthquakes, fires, flooding, landslides, and civil disturbance, which have prompted local government to include Hazard Mitigation Planning in their current initiatives. Hazard Mitigation Planning has become even more important with the recent advent of terrorism, particularly in cities that represent and encompass symbols of economic and cultural posterity.

Past Cooperation Between Redmond and the University of Washington

The City of Redmond has a valuable partnership with the University of Washington. In 1999 the City partnered with the University of Washington's Master of Urban Planning Program. Through a spring studio course, students created a livable City plan to guide the future of Downtown Redmond. Under the direction of Instructor Bob Freitag, a second studio focused on creating a Hazard Identification and Vulnerability Analysis (HIVA) for the City of Redmond in 2001. The HIVA identified risk as it relates to hazard and vulnerability. The purpose of the HIVA was to provide a basic level of knowledge and analysis of the hazards posing a threat to the City of Redmond and to serve as a basis for the City of Redmond to initiate a Hazard Mitigation Plan.

Hazard Mitigation Planning Process

During the Winter of 2002, the City of Redmond and University of Washington Professors Bob Freitag and Frank Westerlund teamed up to create the Hazard Mitigation Plan for the City of Redmond. A Hazard Mitigation Plan is an attempt to identify vulnerabilities and reduce or eliminate the impacts of hazards on cities by mitigating those vulnerabilities. The University of Washington students working together with the City of Redmond crafted the following plan in an attempt to guide Redmond to a more sustainable and disaster-resistant community.

HIVA

The groundwork for the Hazard Mitigation Plan began with the Spring 2001 HIVA (as described above). This document identifies risk and vulnerability within the City of Redmond. Risk was defined as a function of the hazard and the vulnerability. After defining risk, the studio identified the vulnerabilities of the City of Redmond to a variety of hazards including earthquakes, flooding, winter storms, terrorism, civil disturbance, and wildland interface fires. The HIVA also identifies vulnerabilities to these hazards. These vulnerabilities include the residents of Redmond, small businesses, major corporations, lifelines, City infrastructure, and the historic district. Through the identification of the risk and vulnerabilities in the HIVA, students began the development of the Hazard Mitigation Plan for the City of Redmond in January 2002.

Public Process

Public process was an important step in the creation of the Hazards Mitigation Plan. From the first stage of issue identification, City staff were consulted and interviewed for fact finding and checking. An open meeting in the City Council Chambers was held on March 5, 2002. Goals, Objectives and Action Items were presented to City staff and other attendees for response, feedback and input. In April of 2002, a meeting was held with City Planning staff for feedback. On May 27, 2002, a second open public meeting was held to gain feedback and to elicit input from community stakeholders. Other efforts to gain public input included the use of the City of Redmond's planning documents such as the Comprehensive Plan, a document that developed through public participation.

Scenario Development

Scenarios were developed to help identify vulnerabilities, clarify goals and objectives, formulate specific action items, support discussions of benefit to cost relationships and most importantly, facilitate public participation. Three scenarios were developed to address the following situations.

Hazard Scenario 1: Large-Scale Regional Event

a. This event would impact the entire Puget Sound region and could be a shallow Seattle Fault earthquake.

Hazard Scenario 2: Small-Scale Localized Event

a. This event would more likely be scattered, smaller events impacting Redmond, such as a landslide that washes out a road and results in short-term isolation.

Hazard Scenario 3: Catastrophic Localized Event

a. This event is one that would cause extreme damage in Redmond, such as a pipeline explosion or a terrorist event.

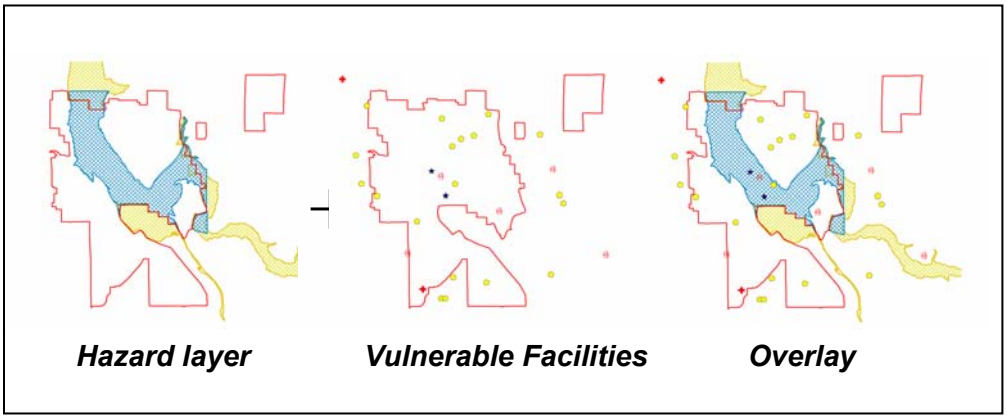
Geographic Information System Analysis

Project research included analysis of Geographic Information System (GIS) and spatial data layers to assess the exposure and vulnerability of Redmond's neighborhoods and infrastructure to hazard events. GIS is a computer system that is able to collect, integrate, manipulate, analyze, and present spatial data. The GIS programs ArcView and ArcInfo, aerial photography,

and spatial data derived from various sources formed the basis for the spatial analysis and mapping.

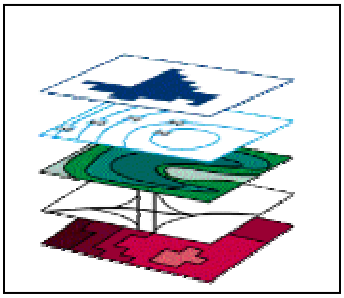
The methodology we used for the spatial analysis and for creating maps is based on the definition of 'risk.' Risk can be defined as a function of a hazard and vulnerability. A hazard without vulnerability, or vulnerability without a hazard, does not result in risk. An overlay of a hazard layer with a vulnerability layer shows which vulnerable structures are located in risk areas (Figure 1).

Figure 1. Hazard + Vulnerability = Risk



The hazard layers used in the project have combined a City of Redmond hazard layer with a King County hazard layer. To keep the two data sources distinguishable, these two different hazard layers are separated by color or by fill pattern, depending on the background colors. Maps and spatial data layers are overlaid in GIS to produce a pattern of distribution on the landscape (Figure 2); analysis of composite layers can indicate where hazard layers present a risk to vulnerable structures.

Figure 2. Example of overlays



Capabilities and Limitations of GIS Analysis

By combining the City's and King County's hazard layers, overlays with hazard layers on top of the available vulnerability layers could be done. Subsequently, these overlays and the aerial photography are used to make rough estimates on the numbers of structures in hazardous areas.

Unfortunately, as with many developing tools, a few limitations are noticed. First of all, the hazard layers are not subdivided in high- medium- and low-risk hazard areas. Besides, important vulnerability layers (i.e., structure footprints and parcel data) and metadata are missing, and other data is over ten years old. Therefore, the spatial analysis and the mapping are not very reliable.

An action item offered in this plan is that the City of Redmond enhance GIS development, emphasizing hazard layers with parcel and structure data, more hazard research, and development of HAZUS data-needs to make spatial analysis more reliable in the future.

How This Document Works

The following two sections present the scenarios that guided development of the Plan. Goals were developed from these scenarios and are described. Objectives are listed under each respective goal and action items are listed by objective.

SCENARIOS

Three hazard scenarios guided the development of the Plan. These three hazard scenarios are outlined below and encompass the range of hazard events that Redmond would typically experience. They were widely used during the public process and help to put a "face" on the risks facing the City.

Hazard Scenario 1: Large-Scale Regional Event

Certain types of hazard events present a threat not only to the City of Redmond, but the entire Puget Sound region. A region-wide terrorist incident, extremely severe winter storm, or a regional earthquake could trigger a large-scale, regional hazard event. The most probable large-scale, regional event would be an earthquake. Based on probabilities generated by the USGS, a regional earthquake scenario, with a 10% probability of occurrence in the next 50 years, would involve ground accelerations between .25 and .35%g. Ground shaking has significant impacts not only on the softer soils within in the City of Redmond as assumed in Scenario 2, but throughout the greater metropolitan area.

Access to Redmond could be cut off by the potential loss of major lifelines such as Highway 520, and Interstate 405. Damage to lifelines and transportation infrastructure could also result in community/neighborhood isolation. Community isolation will be particularly dangerous in that emergency services may be largely unavailable to local residents and businesses. Local residents may prove to be the City's most valuable resource during a large-scale regional event where mutual aid agreements and outside support may be unavailable. The City could make some efforts to increase safety and disaster resilience in local communities.

- Train local residents to be self-sufficient for the initial 72 hours of a disaster.
- Promote citizen and small business involvement in preparedness and mitigation initiatives to encourage a locally driven, community-based effort.

The capacity for local emergency services to respond to a large-scale regional event is questionable. It is likely that this type of event would exceed the capabilities of local emergency services, resulting in increased risk to local residents, businesses, and the economy. The City should focus on developing redundancy in local emergency response resources and personnel to limit the need for, and reliance upon, mutual aid agreements and outside assistance during the initial stages of a disaster.
Additionally, it is reasonable to assume that Redmond may experience a fair amount of structural and non-structural damage during a large-scale regional event. In order to facilitate recovery efforts, it is essential that local residents and business owners submit damage reports to local authorities as soon as possible. Rapid disclosure of damage reports could result in additional financial support from state and federal agencies, increasing the community's ability to recover. Therefore, the City should educate its residents about how and where to submit damage reports, as well as provide a user-friendly means of doing so.

Hazard Scenario 2: Widespread Localized Events

Widespread localized events represent points of disruption within the City of Redmond or the region. These include site-specific events such as landslides or storm water drainage failure. Events such as stream flooding or wildfire may occur across a larger area such as a neighborhood or stream basin. Periods of heavy rain or winter storm events can trigger many small-scale flooding and landslide events within the region.

Each of these events is too small to directly affect the City or region, but each may represent significant disruption to a particular business district or neighborhood. A number of small events may add up to a large impact on the City's residents and economy.

A typical example of these widespread localized events could result from several days of heavy rain.

- Swollen streams produce localized flooding events at road culverts along Bear Creek or other smaller drainages in Redmond. Access through many key roads such as SR 202 (Redmond-Fall City Road) is bottlenecked or lost due to surface flooding.
- The volume of water exceeds the storage capacity of wetlands and storm drainages, particularly those drainages near central Redmond that backwater from the Sammamish River and in older neighborhoods that have not been retrofitted for adequate storm water capacity. Traffic is congested through the City Center and other neighborhoods due to water impounded on the streets.
- Increased drainage destabilizes slopes. Isolated landslides occur on certain vulnerable roads. Traffic is further diverted and congested, cutting off key economic centers and corporations in Redmond from their vendors and customers. A slope fails and blocks a stream channel at its base, diverting its flow through the local neighborhood and flooding homes.
- A small slide and falling trees knock down overhead lines, leaving neighborhood residents and home-based businesses without power, phone, or Internet access for hours. The fallen trees and the toe of the slide may block their egress routes. Emergency services have difficulty responding to residents in homes that have been damaged by a landslide event because of roadway blockage.

Small-scale events may happen individually, presenting a nuisance that diverts traffic, causes lost power to a neighborhood, or inconveniences a small sector of residents and businesses. On an individual basis, response personnel may address these events efficiently and rapidly. However, the response capabilities of Redmond's utility crews, road crews, and fire and emergency response personnel may be highly compromised by a large number of small, localized hazard events. The number of small incidents brought on by heavy rainfall can be manageable one by one but may reach a critical mass if occurring throughout the City. Communities and businesses, particularly those in neighborhoods or districts that are vulnerable to landslides or flooding or have a main ingress/egress route that is vulnerable, should be prepared for short periods of isolation due to these localized hazard events.

Hazard Scenario 3: Catastrophic Localized Events

Catastrophic localized events contain great adverse impacts in a specific geographic location within Redmond. Examples of these specific locations are an area clustered with corporations or an area housing several neighborhoods and associated business districts. These events impact geographic-specific locations and may also cause regional impacts. Catastrophic localized events typically do not occur frequently; however, their impacts are great.

Examples of a catastrophic, localized event include a rupture in the Olympic Pipeline or a terrorist attack. A rupture in the Olympic Pipeline may affect neighborhoods located in proximity to the pipeline. In addition, the attendant disruption of service may cause regional implications. If a large corporation becomes victim to a terrorist attack, adverse local impacts may disrupt business, impact employees, and disable transportation. Given Redmond's large corporation contributions to the regional and national economies, regional and national impacts will result.

The City's capability to reduce the impacts of a catastrophic, localized event is pertinent to maintaining the local economic sector as well as regional and national economies. The City should focus Hazard Planning on business continuity. Business continuity planning can consist of several elements.

- Encouraging clusters of corporations or neighborhoods to plan for a catastrophic disaster. Additionally, the clusters of corporations or neighborhoods should plan for a swift and effective response and recovery period through development of partnerships.
- Identify alternate transportation routes for product and delivery distribution for large corporations and small business districts.
- Develop mutual aid agreements with King County and adjacent municipalities to identify sharing of response and recovery resources.
- Develop a strategy to help neighborhoods, corporation clusters, and business districts to continue normal operations.

Catastrophic localized events do not only impact the City but also consist of regional and even national implications. Partnerships and continuity planning will help reduce the impacts to these types of event as well as help maintain a sense of normalcy post-disaster.

GOALS

Goal 1: Increase Community Resiliency to Large-Scale Regional Events

A large-scale regional event would likely render mutual aid agreements useless, thereby complicating the City of Redmond's emergency response capacity. Local residents could be initially isolated from emergency services.

Overview

Isolated Populations

Following a major disaster, first responders who provide fire and medical services will not be able to meet the demand for these services. Factors such as number of victims, communication failures, and road blockages will prevent people from accessing emergency services they have come to expect at a moment's notice through 911. People will have to rely on each other for help in order to meet their immediate life saving and life sustaining needs.

Emergency Response Capacity

The City of Redmond Office of Emergency Management may have to shoulder most of the responsibility in a major disaster if King County resources are in short supply. The City's OEM may be incapable of handling a high volume of calls and a wide variety of simultaneous emergencies (Source: 02/19/02 meeting with Bob Lovett, Redmond Fire Department). One inherent problem with emergency situations is the unavoidable threat to first responders. Firefighters, police officers, and EMTs are all at high risk during a disaster.

- *Medical Response*: Disasters can quickly overwhelm local emergency personnel, hospitals, and local blood banks. Redmond is in a general flight pattern area, and a plane crash could exceed ability to respond. Bio-terrorism would put a great strain on medical response capability. Terrorism (i.e., with dirty bombs) could release large amounts of radiation and could exceed medical response capability (Source: 02/19/02 meeting with Bob Lovett, Redmond Fire Department).
- *Fire Response*: Drought could result in conditions that would increase the risk of fires from combustible vegetation (low shrubs, trees on slopes). This problem is amplified on steeper slopes where fuel loading can occur at the bottom, and fires can travel rapidly from bottom to top. Fires in Redmond would likely be localized, but access to fires on slopes can be difficult. Widespread fires could exceed response capability. There are currently six fire stations in Redmond that are fairly new and/or have been remodeled (Source: 02/19/02 meeting with Bob Lovett, Redmond Fire Department).
- *Communications:* During a disaster, it is essential to have a clear, reliable means of communication between cooperating emergency response groups. The City of Redmond (and King County) is currently using an 800 MHz radio operating system to manage emergency communications in a major disaster. During the Nisqually earthquake in 2001, this same system displayed significant weaknesses. Vulnerability of communication centers, phone lines, and other communication mechanisms could amplify the severity of this issue (Source: 02/19/02 meeting with Bob Lovett, Redmond Fire Department).

Emergency Personnel and Resources

Redmond's population as of April 2001 was 45,256 and as of August 2000, 64,241 people worked in Redmond each day. Increased daytime populations may result in inadequate numbers of response professionals and support facilities to handle expected needs during and following a major disaster (emergency managers, doctors, EMTs, firefighters, police officers, etc.) In a major earthquake, there is the potential for partial loss of fire/EMS emergency response capacity. If a fire station should collapse, trapping two or three fire trucks inside, the City's fire response capacity would be seriously undermined. If transportation routes are down, medical professionals may not be accessible, and the capacity for post-event care (shelters, triage centers, hospital care) could be seriously undermined. Important response centers (i.e., fire stations, police stations, medical facilities, and communication centers) should be redundant and reinforced.

Hazard Scenario

Certain types of hazard events present a threat not only to the City of Redmond but the entire Puget Sound region. A region-wide terrorist incident, extremely severe winter storms, or a regional earthquake could trigger a large-scale, regional hazard event. The most probable large-scale, regional event would be an earthquake. Based on probabilities generated by the USGS, a regional earthquake scenario, with a 10% probability of occurrence in the next 50 years, would involve ground accelerations between .25 and .35%g. Ground shaking has significant impacts not only on the softer soils within the City of Redmond as assumed in Scenario 2, but throughout the greater metropolitan area.

Access to Redmond could be cut off by the potential loss of major lifelines such as Highway 520, and Interstate 405. Damage to lifelines and transportation infrastructure could also result in community/neighborhood isolation. Community isolation would be particularly dangerous in that emergency services may be largely unavailable to local residents and businesses. The City should make efforts to increase safety and disaster resilience in local communities by training local residents to be self-sufficient for the initial 72 hours of a disaster. Local residents may prove to be the most valuable resource the City has during a large-scale regional event where mutual aid agreements and outside support may be unavailable. The City should also promote citizen and small business involvement in preparedness and mitigation initiatives to encourage a locally driven, community-based effort.

The capacity for local emergency services to respond to a large-scale regional event is questionable. It is likely that this type of event would exceed the capabilities of local emergency services, resulting in increased risk to local residents, businesses, and the economy. The City should focus on developing redundancy in local emergency response resources and personnel to limit the need for, and reliance upon, mutual aid agreements and outside assistance during the initial stages of a disaster.

Additionally, it is reasonable to assume that Redmond may experience a fair amount of structural and non-structural damage during a large-scale regional event. In order to facilitate recovery efforts, it is essential that local residents and business owners submit damage reports to local authorities immediately. Rapid disclosure of damage reports could result in additional financial support from state and federal agencies, increasing the community's ability to recover. The City should educate its residents about how and where to submit damage reports as well as provide a user-friendly means of doing so.

OBJECTIVES AND ACTION ITEMS FOR GOAL 1

Objective 1

Develop alternative emergency government operations capabilities outside of high-risk areas.

Discussion

Redmond's Municipal Campus is located in a known hazard zone (refer to Appendix A). Local government operations are highly centralized in this area (please refer to Appendices B and I). The following departments are located within the hazard zone: Redmond City Hall (including Human Resources, Executive Offices, Planning Department, Public Works Administration, Transportation Department, Engineering Department, and Utilities Department); Public Safety Building (including Police Department, Finance Department, and Council Chambers); King County Courthouse; Redmond City Annex (including Parks Administration, Natural Resources Department, and Storm water Department); West Park (including Public Works Construction and Inspection); and the Technology Center (including Information Services). The high degree of centralization of government operations in a hazard zone not only represents a significant threat to the local emergency response system but to the entire City of Redmond and its functions. Loss of one or more of these buildings would have severe impacts on the overall functionality of the City. The centralization of local government operations makes the City vulnerable not only to natural hazards but to acts of terrorism.

Action Items:

1.1 Decentralize local government operations

- The City will attempt to decentralize its local government offices and operations by relocating specific departments to alternative sites throughout the City that are not located in known hazard zones.

1.2 Consider stringent retrofits and protective measures if relocation is not feasible, to ensure that its essential facilities are resilient to multiple types of hazards.

- The resiliency of City facilities should be a top priority in hazards mitigation. The City will utilize the most current design methods to ensure that its facilities are strong enough to withstand a disaster.
- The City will publicize its efforts to decentralize and/or retrofit its facilities as a model to support Redmond's commitment to hazards mitigation.

1.3 Construct an alternative EOC (Emergency Operations Center) outside of the known hazard zone

- The City will investigate the construction of an additional EOC. The site should be fully equipped and ready to implement in the event that the existing EOC is damaged or inoperable.

Objective 2

Strengthen the local emergency response system to limit the need for, and reliance upon, mutual aid agreements and outside assistance during the initial stages of a disaster.

Discussion

The capacity for local emergency services to respond to a large-scale regional event is questionable. It is likely that this type of event would exceed the capabilities of local emergency services, resulting in increased risk to local residents, businesses, and the economy. The City should focus on developing redundancy in local emergency response resources and personnel to limit the need for, and reliance upon, mutual aid agreements and outside assistance during the initial stages of a disaster.

Action Items:

2.1 Identify "weak spots" in the City's emergency response system within the context of mutual aid dependencies. Prioritize these weaknesses and make plans for strengthening them through local initiatives.

- Work with neighboring cities and the county in documenting the current state of resources and supporting regional solutions. (i.e., pre-positioning, staging, protocol).
- Work with neighboring cities and the county in conducting functional assessments of emergency resources and personnel immediately following major disasters to identify regional weaknesses and prioritize areas needing improvement.

2.2 Work with neighboring cities and the county in updating the existing Emergency Response Plan to include guidelines for dealing with inadequate resources/personnel during the initial stages of a disaster.

- Use the data gathered through the report submittals and functional assessment from emergency services organizations to identify weaknesses in the system and develop contingency plans for addressing anticipated inadequacies.
- Train local emergency response professionals in methods for dealing with volunteers and relief workers.

Objective 3

Make full use of current technologies in the development of goal to create safer, more resilient communities.

Discussion

The City of Redmond should focus its efforts on utilizing its existing resources. The City does not have enormous financial capabilities at this time; therefore, it is unreasonable to assume that expensive, short-term programs will be considered. However, the City does possess a number of resources that could be developed and enhanced to include disaster planning as a primary theme. In doing so, the City would be able to focus on gathering hazard information in the short-term with the intent of making long-term financial decisions when the best available

data is obtained. One of the City's best resources is its GIS division. Enhancement of this program would result in planners having the necessary geo-spatial information to make better decisions (Refer to appendices for examples of GIS maps).

Action Items:

3.1 Enhance the City's ability to identify and understand the hazards they face by investing in the development of computer technologies.

- The City will maximize the utility of its existing Geographic Information Systems (GIS) capabilities by including disaster planning as a primary role of the local government's GIS division.
- The City will prioritize and begin to develop the data sets that are necessary to test hazard scenarios and mitigation tools in FEMA's Hazards U.S. (HAZUS) loss estimate modeling program.

3.2 Enhance the City's existing "Disaster Preparedness" website to include a real-time disaster information center to provide important information to, and communicate with, the public during all stages of a disaster.

- The City can utilize the Internet as a communication tool as well as an education tool. The “disaster information center” portion of the website would provide local residents with hourly updates during disaster situations and could provide a means of reporting emergencies when phone lines and cellular phones are inoperable.

Objective 4

Support a region-based focus on mitigation and sustainability through working with neighboring cities and the county in strengthening public education and outreach programs.

Discussion

Data collected immediately following a major regional event, such as an earthquake, can be critical during emergency response and recovery. Some data is perishable and must be collected as soon as possible. They should also establish a mechanism for relaying information from scientific and engineering investigations to emergency managers. Rapid disclosure of damages from local residents could help to ensure that the maximum amount of financial assistance from government organizations is realized. Within a regional context, a mitigation project in Kirkland for instance, will free up personnel and assets to help Redmond in a regional event.

Action Items:

4.1 Increase public awareness and preparedness by developing a series of regionally available public workshops or seminars to educate homeowners and local businesses on earthquake-resilient practices.

- The City, in cooperation with neighboring cities and the county, will address the development of a series of seminars focusing on disaster preparedness, community resiliency, and mitigation, and continue to utilize its local schools as conference centers for hosting these workshops.

- The City, in cooperation with the county, will work to supplement the existing school-based preparedness programs with after-school programs geared toward students' parents. Having the seminars in the evening and encouraging parents to participate would result in safer homes and communities.

4.2 Increase community recovery capabilities by creating a system whereby local residents and businesses can immediately submit damage information to responders and the proper authorities.

- Rapid submittal of damage estimates is essential following a disaster and should be a high priority for local residents. The “disaster information center” (refer to objective 2, action item 2.2) could provide a convenient means of submitting this information digitally.
- The City could consult with the USGS and the National Weather Service to determine how to best approach this type of program. The USGS utilized its web-based capabilities to gather earthquake information from citizens through its Earthquake Hazards Program's “earthquake reporting website.” The National Weather Service radio is becoming an all-hazards service.

Objective 5

Identify and protect critical facilities in the City of Redmond

Discussion

Critical facilities are those that would present a high value/high impact during a potential disaster. Selecting which facilities to deem “critical” is a subjective call that the City has to make. A high value/high impact facility is one that presents the potential of having a major impact on local, regional, or national populations or infrastructure if damaged or destroyed. Facilities or events that host large crowds should also be considered. It is also important to identify controversial facilities such as family planning clinics or those that cater to alternate lifestyles. Facilities such as Jewish, Muslim, and Catholic community centers may also be of concern. The most common critical facilities (i.e., police stations, fire stations, hospitals, etc.) are not the only facilities that play a critical role during and after a disaster (Please refer to Appendix B).

Action Items:

5.1 Re-evaluate the risks and demands to critical facilities in light of a regional event to facilitate prioritizing structural and non-structural retrofits based on vulnerability.

- The City will re-evaluate vulnerability and establish criteria for hardening critical facilities that recognizes the demands inherent in a regional event. As a result of such a re-evaluation, the City will consider the establishment of some critical functions outside of the City.

5.2 Continue hazards mapping efforts and distribute data to local officials, as it develops to enhance incorporation of mitigation into Land Use Planning.

- The City's GIS division should seek to establish and/or strengthen relationships with other jurisdictions, consultants, and academia to ensure that maps are as up-to-date as possible, and that local planners have the best available information.

5.3 Review hazard zones and critical areas in Washington (i.e., wetlands, aquifer recharge areas for potable water, fish and wildlife habitat conservation areas, frequently flooded areas, geologically hazardous areas) and develop draft legislation to restrict building of critical facilities in these areas.

- The City will consider, based on the "Best Available Science" Rule of the Growth Management Act, restricting construction of any critical facility in an area that qualifies as a "critical area" under the GMA.
- Redmond's Comprehensive Plan policies will be amended as needed to support the City's efforts to satisfy GMA requirements related to Critical Areas and the use of "Best Available Science."

5.4 Develop infrastructure development policies that will limit the placement of critical infrastructure facilities in hazard-prone areas or served by vulnerable lifelines.

- The City will focus on developing policies that will require no construction of essential transportation, utilities, and communications facilities be permitted in at-risk areas.
- The City will also consider those important infrastructure facilities that are located outside of the City limits and make efforts to address these complex problems as well.

Objective 6

Support regional efforts to provide financial incentives to encourage local business owners and residents to conduct seismic upgrades in their facilities.

Discussion

There are no governmental financial programs in Washington State to encourage property owners to conduct seismic safety upgrades of their facilities. Many insurance providers now only provide insurance to homes and businesses that have undergone retrofitting or are of a structure type that is considered seismically resilient.

Action Items:

6.1 Provide incentives to policyholders to undertake structural and non-structural seismic retrofits.

- The City, in cooperation with the State Insurance Commissioner, will work to find financial incentives with either insurance companies or federal grant programs.

6.2 Encourage lending institutions to provide low-interest mitigation loans for businesses and homeowners.

- The City, along with the State Insurance Commissioner, should work with insurance companies to find these incentives.

6.3 Allow homeowners to apply a portion of their property tax to retrofit their residence.

- The City will evaluate a program to allow homeowners to apply a percentage of their property tax to seismic retrofitting as a one-time relief or over a specific time period up to a ceiling amount.

Goal 2: Reduce Vulnerability of Single-Family Homes and Home-Based Businesses to a Variety of Hazards

The City of Redmond has a large community of single-family residents. The geology and topography of the City may place residents at risk to a variety of hazards, including earthquakes, landslides, winter storms, wildland fires, and flooding. Home-based small businesses are also vulnerable to the same hazards.

Overview

This issue addresses the vulnerability of single-family homes in Redmond to a variety of natural hazards. Each hazard is discussed separately below. The action items made in this section are meant to enable homeowners to minimize the damage to their homes and handle short-term isolation following a disaster event.

Earthquake Hazard

- Western Washington is earthquake country, and major earthquakes will occur in the future in this region. The degree of physical damage to life and property will depend on the location, magnitude, and intensity of the event.
- Ground shaking is the principle hazard associated with earthquakes. Common secondary hazards include liquefaction, landslides, fires, and damage to lifelines and other infrastructure.
- Structural damage to older homes, non-wood frame brick homes, and newer homes on soft soils may occur during and after severe ground shaking. Non-structural damage can result in personal injury and fires. Older homes located in seismic hazard areas are at risk for both structural and non-structural damage.
- Landslides are a secondary hazard of ground shaking. As described below, there are many areas within the City that are vulnerable to landslide hazards.

Landslides

- Local sensitive area maps and the Redmond Community Development Guide identify areas at risk for landslides based on slope, soil or geologic properties, or hydrology. Landslides may be triggered by heavy rains, drainage problems, land movement and disturbances (particularly on previously disturbed slopes), earthquakes, and flooding events (Please refer to Appendix C).
- Common secondary hazards associated with landslides include broken utility lines, damage to lifelines, property damage, and possible flooding.

- Properties at the top, bottom, or face of steep slopes are particularly vulnerable to landslide events. Areas of particular concern include the slopes along Redmond-Woodinville Road where numerous single-family and multi-family residences are located. Education Hill above Avondale Road also contains a large number of single-family homes (between 75 and 150 homes) on top of the slope as well as a substantial number of multi-family homes (at least 12 eight-unit condominiums) on the slope that are vulnerable to damage from landslides. Damage to properties may occur due to slope failure and direct impact from soils, water, and vegetation.

Flooding Hazard

- Redmond does not contain many areas subject to regular flooding events. Unpredictable flooding would be associated with creeks, wetlands, and storm water infrastructure. Isolated flooding does occur, especially backwater flooding along the Bear Creek near Redmond Way beneath the railroad tracks (Please refer to Appendix D).
- New development can significantly impact hydrology, modifying the pattern of water delivery to creeks, wetlands, and storm water systems. This in turn may modify the occurrence of flooding in Redmond's existing developing communities. The population of Redmond is expected to increase by approximately 17,000 people and 10,000 new homes by 2012. This increase in development and impervious surfaces will increase the rate of flooding especially along Bear Creek. Flooding problems could be compounded if agricultural lands within Redmond are built up.
- Common secondary hazards associated with flooding include landslides and fires.

Winter Storms

- Redmond's topography, with hillsides and valleys, creates microclimates and wind tunnels that can compound the effects of a severe winter storm. A severe storm with high winds or snow can create pockets of isolation for Redmond's residents if residential roads and/or main arterials become impassable.
- Several Redmond neighborhoods, including Rose Hill and Education Hill, could be left powerless and isolated in the event of a severe winter storm as a result of high winds, tree blow down, or heavy snow loads on power lines.

Fire Hazard

- Redmond has a number of areas with steep slopes where fuel loading and fire travel can occur. Fire may be triggered by periods of drought, hazardous material release, or earthquakes. Redmond also has a great deal of combustible vegetation, including low shrubbery and steep wooded slopes.
- Properties at the top, bottom, or face of steep slopes are particularly vulnerable to fires. Fires originating at the base of slopes (where fuel loading can occur) can have rapid upslope movement and be very difficult to access. At-risk areas include Education Hill, particularly above Avondale Road, where homes are typically surrounded by trees and other vegetation, and where as many as 150 homes may be located on steep slopes.

- Common secondary hazards associated with fires include damage to buildings and property, loss of vegetative cover, business interruption, landslides, possible flooding, injury, and loss of life

OBJECTIVES AND ACTION ITEMS FOR GOAL 2

Objective 1

To reduce the vulnerability of single-family homes in high risk neighborhoods to a variety of hazards

Discussion

There are specific neighborhoods within the City of Redmond that are at greater risk to damage and isolation from a hazard event than others. Particularly, neighborhoods of Education Hill above Avondale Road are vulnerable to landslides, isolation from winter storms, and damage from fire. As many as 150 homes are located on slopes above Avondale Road that have been identified on local hazard maps as landslide prone areas. Additionally, homes on Education Hill were built in the late 1960's through the mid to late 1970's, prior to the seismic building code standards. It is questionable as to whether these homes are tied to their foundations, making them vulnerable to damage from ground shaking. Other areas of concern include the downtown Redmond area, where single-family homes are low in number but generally built in the early 1960's, again prior to seismic building code standards. Downtown Redmond contains large numbers of relatively new multi-family units. While these units are built to today's code, they are located on soft, alluvial soils, making these homes vulnerable to damage from ground shaking.

Ground shaking is a secondary effect of earthquakes. Ground shaking is magnified on areas of soft soils such as those found in the seismic hazard areas of Redmond. Older homes and homes that are not tied to their foundations are particularly vulnerable to damage caused by ground shaking. The Project Impact Home Retrofit Program began in Redmond in 1997. The program was designed to assist homeowners in seismic strengthening and retrofitting their homes. On the City of Redmond home page there are plans and information about the program. Unfortunately few people have taken advantage of the program.

Landslides are the release of rock, soil, and other debris and its subsequent movement down a slope or hillside. Landslides are generally caused by a variety of factors, including geology, gravity, weather, groundwater, and human activity. Ground shaking during an earthquake is also a major trigger for landslides. The largest areas vulnerable to landslides in Redmond include the roads above Lake Sammamish, north of Redmond-Woodinville Road, and along the eastern slopes of Avondale Road. Residents on, above, or below a slope are vulnerable to loss or damage to lives, home, or property. Residents also face short-term isolation if a landslide were to wash out a road.

Destructive winter storms come in many variations and combinations of wind, ice, rain, and snow. Nearly all destructive winter storms occur in the months between November through April when the jet stream is over the west coast, and Pacific low-pressure systems are more frequent (HIVA). Any winter storm can bring high, destructive winds, heavy rain, and/or snow. The entire City of Redmond is vulnerable to winter storms and damage caused by heavy snow load or high winds. At particular vulnerability to high winds are the neighborhoods of Rose Hill and Education Hill. These neighborhoods are generally lower density, where trees and overhead power lines surround homes. The residents of these communities are vulnerable to power outages and isolation during a severe winter storm event. In most instances there will be

ample severe winter storm warnings given by local weather forecasters and the National Weather Service to allow residents to prepare for an approaching event.

A wildland fire is any instance of uncontrolled burning in grasslands, brush, or woodlands. The urban/wildland interface is the area in which houses and non-residential structures, businesses, public buildings, and utility stations encroach on undeveloped forested lands. Under normal weather and precipitation conditions, the City of Redmond faces low risk of wildland interface fires. During non-normal weather conditions, such as periods of drought and extreme heat, the older neighborhoods on Education Hill and Rose Hill where single-family homes are typically surrounded by trees and other vegetation may be vulnerable to damage from wildland fires.

Action Items:

1.1 Implement neighborhood-based risk reduction programs

Landslides

- Educate homeowners regarding steep slope issues and how to minimize potential for landslides.
  - Topics could include the hazards of dumping fill and debris at the head of a steep slope, erosion control landscaping, and storm water drainage problems.
  - This could be addressed and coordinated by the Public Works Departments.
  - Earthquakes and Ground Shaking
- Promote technical assistance information programs, such as the Project Impact Home Retrofit Program, for homeowners addressing items such as seismic strengthening of homes and non-structural retrofitting.
  - To promote and help education of homeowners, the City could hire an intern from a local high school to canvas at-risk homes and neighborhoods with information regarding the Home Retrofit Program. The City and the Building Department would prepare the information to distribute to homeowners.
  - Libraries, insurance companies, and realtors can also be used as a means to provide information.
  - Availability of private sponsors and organizations should also be investigated to provide motivation and encourage the availability of a tool lending library that gives approximate numbers and costs of certain types of retrofitting.
  - The Project Impact training should include non-structural retrofit training as well as information for structural retrofits.
- Provide financial incentives for retrofitting for neighborhoods at highest risk.
  - Consider applying for home and home-based business retrofitting assistance through the Hazard Mitigation Grant Program (refer to Historical and Cultural Resource section).

Winter Storms

- Host public education workshops for single-family homeowners regarding vulnerabilities to winter storms.

- Issues to discuss could include tree management and how residents handle short-term isolation, such as creation and maintenance of an isolation kit with food and water for 72 hours.

Wildland Interface Fires

- Implement public fire safety programs that disseminate fire safety information to the public, especially in times of increased vulnerability.
  - Efforts can address types of combustible roof coverings, fire safe construction techniques for fire hazard areas, and the importance of clearing brush from around homes.
  - The City and Fire Department can coordinate programs like this.
  - Information should be provided to those homes located in isolated fire hazard areas in Redmond and available at the Fire Department for interested individuals in times of increased vulnerability and drought conditions.
- Encourage fire resistant landscaping techniques within the City of Redmond.
  - The City, in coordination with the Fire Department, should hold forums on fire resistant planting and encourage the development of defensible space around homes.

Objective 2

To reduce the vulnerability of single-family homes located on, above, or below steep slopes to damage from landslides.

Discussion

(Please see discussion for landslides under Objective 1 above.)

Action Items:

2.1 Restore stability of degraded slopes through re-vegetation and slope stabilization efforts.

- Public Works can identify and lead restoration of unstable slopes that threaten single-family homes.
- In hazardous situations (when landslide risk is high on certain slopes after heavy rain or in the aftermath of a large earthquake), consider relocation.
- Apply for Hazard Mitigation Assistance Grant funds.

Objective 3

To reduce the vulnerability of single-family homes located in flood hazard areas to damage from isolated flooding.

Discussion

There are three types of flooding that can occur in the City of Redmond: along the Sammamish River, along streams, and surface water flooding. While flooding does pose a risk in Redmond,

the risk is minimized due to stream and river re-channeling. Most flooding would occur along Bear Creek and would most likely be nuisance with low severity affecting downtown businesses and residential areas. Businesses would be affected by short-term interruptions, but there would be no structural damage. All flooding would be preceded by ample warning time. It requires a severe weather event and substantial rain to produce a flood condition, allowing time for homeowners to prepare for the event.

Action Items:

3.1 The city will apply the new International Building Codes requiring flood-proofed homes in the floodplain and regulations specifying no-fill floodplain, zero-rise floodway analysis, and vegetation retention standards throughout Bear Creek. These regulations will be expanded and applied in all flood-prone areas of Redmond.

Objective 4

Increase safety and disaster resilience in Redmond communities by training local residents to be self-sufficient for the initial 72 hours of a disaster.

Discussion

All disaster events that occur can leave residents isolated in the days immediately following the disaster. Access to Redmond could be cut off by the potential loss of major lifelines such as Highway 520 and Interstate 405. Community isolation will be particularly dangerous in that emergency services may be largely unavailable to local residents and businesses. The City should make efforts to increase safety and disaster resilience in local communities by training local residents to be self-sufficient for the initial 72 hours of a disaster. Local residents may prove to be the most valuable resource the City has during a large-scale regional event where mutual aid agreements and outside support may be unavailable.

Action Items:

4.1 Develop partnerships with FEMA and local organizations to promote disaster preparedness and emergency planning strategies.

- FEMA CFP (Community and Family Preparedness) Program
- SDART (Seattle Disaster Aid & Response Teams)

4.2 Supplement communities' response capability after a disaster by recruiting civilians to be trained as neighborhood, business, and government teams that, in essence, will be auxiliary responders.

- CERT (Community Emergency Response Teams)
- SPAN (Strengthening Preparedness Among Neighbors)

Objective 5

Develop Community Disaster Preparedness Plans tailored to each specific Redmond community, promoting citizen and small business involvement to encourage a locally driven, community-based effort.

Discussion

Each individual community in Redmond will face unique challenges in any large-scale hazard event. Certain communities may be subject to greater risks than others. For example, those communities located within the vicinity of the Olympic Pipeline would be at much greater risk in the event of a pipeline leak or rupture than those located further from the pipeline. Also, damages to transportation infrastructure will likely result in limited access to certain communities, while others remain fully accessible. Therefore, it is important that each individual community understands its own unique vulnerabilities and makes efforts to address them. Community Disaster Preparedness Plans would be a valuable means of identifying community-specific vulnerabilities and established preparedness and/or mitigation strategies that would result in an increased level of community safety.

Action Items:

5.1 Develop partnerships with FEMA and local organizations to promote disaster preparedness and emergency planning strategies.

- Consider Wingspread Principles as a tool for guiding community-based disaster preparedness efforts:
  - Sustainability
  - Planning and Incentives
  - Partnerships
  - Locally-Driven Process

5.2 Establish a Local Steering Committee to assist in the development of the program. The committee could hold monthly meetings to monitor the progress of individual neighborhoods, identify shortcomings, and determine future goals.

- Encourage community organizations and their leaders to establish a committee to monitor preparedness and mitigation efforts within the community.
- Hold regular meetings to discuss issues and assess existing needs. Invite public officials, technical experts, business owners, and academics to attend meetings to provide insight and assistance.

Goal 3: Reduce Vulnerability of Small Businesses

Small businesses are an important segment of Redmond's economy. They not only provide goods and services to the public, they also support the corporations that call Redmond home. They are a major component of Redmond's economy and are vulnerable to a variety of disasters, with most not having the ability to recover from significant events.

Overview

This issue addresses the vulnerability of individual small businesses located within the City of Redmond. Natural hazards that affect small businesses in Redmond include earthquakes, flooding, winter storms, fire, and landslides. There are a number of things that small business

owners within the City of Redmond can do to decrease their vulnerability to a variety of natural and manmade hazards.

Small Business Vulnerability

Of the 4,500 businesses in Redmond, 75% are small businesses that employ fifty or fewer people. In 1997, Redmond's retail sector generated $407 million in taxable retail sales. Small business operations are vulnerable to a variety of hazards including secondary effects such as loss of power and disability of transportation infrastructure (Source: 2/4/02 meeting with Mayor Ives, Redmond demographic information, and Redmond Chamber of Commerce). Some of these businesses are located in single-family homes throughout Redmond. Single-family home vulnerability is covered in the previous section.

Old Town/City Center Vulnerability

Old Town City Center contains many small businesses housed in designated historic landmarks. These masonry buildings were constructed between 1900 and 1910 and, because of their location in Redmond's seismic hazard area, they are vulnerable to significant damage in the event of an earthquake (Source: 2/15/02 meeting with Diana Broadie, Planner, Historic Preservation Program, and Redmond's seismic hazard area map).

Small Business Preparedness

Few businesses have developed business resumption plans. Financial costs incurred from a hazard event may place significant deterrents to recovery. Additionally, few businesses have hazard mitigation plans, and City sponsored events encouraging small businesses to adopt recovery and mitigation plans received low participation (Source: 2/04/02 meeting with Robert Schneider, Redmond Emergency Preparedness Coordinator and 2/15/02 meeting with Ed Billington, Operations Commander, Redmond Police Department).

OBJECTIVES AND ACTION ITEMS FOR GOAL 3

Objective 1

To ensure survivability and expedite business resumption following a disaster

Discussion

Estimates indicate that 43% of small businesses never reopen after a local disaster (Institute for Business and Home Safety). Small businesses are a major component of both Redmond's economy and the cities character. The small businesses of Redmond are not only important retail businesses for Redmond's residents they are also important out-sources for corporations in Redmond. The following action items provide a means for Redmond's small businesses to ensure survivability, minimize losses and resume business operations as quickly as possible following a disaster.

Action Items:

1.1 Design events to promote business continuity

- The Chamber of Commerce and small business organizations, working with other eastside cities to share costs of work and address inter-jurisdictional Issues, could coordinate this.
- Specific educational topics should include preparation for short-term business disruptions and contingency plans for emergency situations.
- Relevant information includes structural improvements (redundancy in communication systems and generators) as well as improving functional connection and recovery between businesses that rely heavily upon one another for function.

1.2 Facilitate partnerships and sharing of resources between small businesses and large corporations (refer to Vulnerability of Corporations, action item 1.4)

- Large corporations should be encouraged to provide resources to their vendors, back-up generators, supplies, etc., to facilitate business recovery and resumption following a disaster.

Objective 2

To encourage small businesses to reduce their vulnerability to a potentially disastrous event

Discussion

Redmond's small businesses are vulnerable to a variety of hazards, primarily earthquakes, flooding, and winter storms (see background information regarding earthquakes and ground shaking, and flooding in the Vulnerability of Single-Family Homes Section).

As previously stated, ground shaking is the principle hazard associated with earthquakes. Structural damage to older buildings, non-wood frame brick buildings, and newer buildings on soft soils may occur during and after severe ground shaking. Businesses located in Redmond's downtown and Old Town retail sector are on the soft alluvial soils of Redmond's seismic hazard area. Many of these businesses are also located in structures that are un-reinforced masonry buildings.

Redmond does not contain many areas subject to regular flooding events. Unpredictable flooding would be associated with creeks, wetlands, and storm water infrastructure. Isolated flooding does occur, especially backwater flooding along Bear Creek near Redmond Way beneath the railroad tracks. The Redmond City Center, where several small businesses are located, is located within the 100-year floodplain of the Sammamish River, putting small businesses at risk to flooding.

Action Items:

2.1 Provide incentives for property owners to retrofit un-reinforced masonry buildings and buildings on soft soils that are not tied to their foundations in hazard areas.

- Expedite permits, provide technical guidance, and refer qualified professionals to business owners who need assistance.
- Work with local banks, the county, and Washington State Seismic Safety Committee to provide property tax based incentives for retrofitting.

2.2 Train business owners to properly secure all non-structural items that could be a hazard through non-structural retrofit training.

2.3 Host forums for small businesses on mitigation and preparedness practices.

- Hold the meetings at times that are convenient for business owners in order to get as many as possible to attend. This will increase awareness of hazards and encourage business owners to adopt hazard mitigation and/or business contingency plans.
- Partner with neighboring communities to enable the business communities within and outside of Redmond to share knowledge and resources with each other

Goal 4: Reduce Vulnerability of Large Corporations

Redmond's large corporations and local small businesses are vulnerable to major economic impacts as a result of a hazard event.

Overview

Redmond's Large Corporations

Of the 4,500 businesses in Redmond, a handful consists of large corporations that employ over 1,500 people. These corporations serve regional, national, and international markets and attract widespread attention due to the valuable contributions they have made in telecommunications, medicine, and aviation. These contributions have helped increase the quality of human life and business on a worldwide scale and represent great economic posterity. Source: February 15, 2002 communication with Ed Billington, Operations Commander, Redmond Police Department, and Greater Redmond Chamber of Commerce website (http://www.redmondchamber.org/).

Location of Large Corporations and Hazard Scenarios

Several of the large corporations are located in the Overlake Advanced Technology/Manufacturing Center. The boundaries of the center are Bell-Red Road in the southwest, NE 20 Street in the south, 148 Avenue NE in the east, and SR 520, 156 Avenue NE, and NE 40 Street in the west. The large corporations in the center are vulnerable to two hazard scenarios: 1) a large-scale regional event, such as a severe earthquake; and 2) a catastrophic localized event, such as a terrorist attack or a rupture in the Olympic Pipeline. These hazard scenarios encompass a variety of vulnerabilities of large corporations and their associated local small businesses. Source: Redmond Comprehensive Plan.

Vulnerability of Regional Employment Sector

Redmond's large corporations are a regional employment center. The corporations employ 65,000 people, compared to the current City population of 45,260. Microsoft Corporation alone employs 20,000 and experiences a daytime population of nearly 40,000 in visitors, contractors, suppliers, deliverers, etc. The Redmond Comprehensive Plan states that by 2012, the number of jobs in Redmond is forecasted to increase by 76%. Impacts of a hazard event may decrease the productivity of the current workforce through job losses and losses in contracts of regional vendors. Source: May 23, 2002 communication with Robert Schneider, Redmond Emergency

Manager, Redmond Fire Department, Redmond Comprehensive Plan, and City of Redmond website (http://www.ci.redmond.wa.us).

Vulnerability of Transportation Lifelines

Bell-Red Road, 148th Avenue NE, and SR 520 act as key arterials linking the center with the greater City and region. A large-scale regional earthquake or a terrorist attack may disable these transportation lifelines. Disability of these transportation lifelines would affect movement of employees, movement of goods and services, and isolate the large corporations that depend on these key arterials for daily business operations. Source: February 15, 2002 communication with Ed Billington, Operations Commander, Redmond Police Department

Vulnerability of Local Small Businesses

Many of Redmond's smaller businesses act as suppliers, contractors, vendors, and tenant businesses to large corporations. Many local small business jobs are dependent on jobs in the large corporations and vice versa, although the exact ratio has not been calculated. If one imagines that five local small business jobs support one job in the large corporation, job losses in large corporations would adversely impact the small business employment sector.

Vulnerability of Local Contribution of Large Corporations

Redmond's large corporations provide many jobs for Redmond's residents as well as contracts for local small businesses. Large corporations also support tenant businesses and lease facility and warehouse space to them. General businesses, such as restaurants, retail stores, gas stations, etc., profit from the daytime population of large corporations as well.

An economic disruption to one or more of Redmond's large corporations will affect the future capability of attracting businesses to locate in the City, as well as retaining current businesses, if the local economic sector is non-productive. In addition, an economic disruption will directly affect the City's residential population through job losses, small business productivity through losses in contracts, and may ultimately decrease consumer spending and affect the City's tax revenues.

OBJECTIVES AND ACTION ITEMS FOR GOAL 4

Objective 1

To facilitate partnerships between large corporations and local small businesses

Discussion

Large corporations have the resources to mitigate and prepare for hazard events. They have knowledgeable staff, business resumption plans, insurance, training resources, emergency operation centers, and back-up facility space, equipment, and operating procedures. Large corporations work diligently to update their mitigation and preparedness strategies because they typically have a great deal to lose in a hazard event.

Local small businesses also have a great deal to lose in a hazard event, sometimes their entire livelihoods. Local small businesses typically do not have resources similar to large corporations. Many small businesses find Mitigation Planning cost-prohibitive and time-consuming, and the principles associated with mitigation seem complex.

Currently, there is no model in the nation that works to facilitate partnerships between large corporations and local small businesses. The City of Redmond would benefit from facilitating partnerships between its large corporations and its small businesses given their significant interdependency. Thus, the City is poised to embark on a unique community, public-private approach to reducing the impacts of economic disruption and hazard events.

Action Items:

1.1 Use hazard scenarios and involve the business community in risk assessment. Conduct an economic impact analysis. The analysis will act as a springboard for action.

- The economic impact analysis will identify:
- The ratio of local small business jobs to large corporation jobs and quantify risks.
- Potential losses in customer base due to extensive damage and relocation of large corporations and closure of tenant businesses and local vendors.
- Potential losses to the local economy including lost wages for workers, decreased revenues for businesses, and relocation of residents.
- Potential losses in decreased consumer spending and decreased tax revenues for local government.

Source: Federal Emergency Management Administration, 2000. Rebuilding for a More Sustainable Future: An Operational Framework, FEMA Project Impact, Edition 1, November 2000.

1.2 Develop a Project Impact-style program that focuses on raising citywide public awareness of business Mitigation Planning.

- Build community support. The City can lead the organization of a discussion group such as Contingency Planners And Recovery Managers (CPARM). CPARM members represent a wide variety of professionals in the contingency planning field and share best practices to increase disaster resiliency of the entire group. Source: Seattle Project Impact website (http://www.cityofseattle.net/emergency_mgmt).
- Lead public outreach and educational initiatives. The program can use the findings of the economic impact analysis (see action item 1.1) as a foundation to sponsor events and conferences to increase public awareness of business Mitigation Planning, i.e., what it is, what it entails, how it benefits businesses, etc.
- Seattle Example: Seattle Project Impact is embarking on an initiative to educate the Seattle business community of the benefits of business Mitigation Planning. The initiative involves organizing a forum for discussion among contingency planners and businesses, developing simple, reader-friendly materials, gaining further understanding of the City's business framework (i.e., who depends on whom and for what), creating a benefits package for participating businesses, and identifying non-traditional fund sources to build on Hazard Mitigation Planning goals. The Seattle initiative is in its beginning phases but once completed can be exported to other communities to use as a model.
- Increasingly, mitigation projects can qualify for Community Development Block Grants (CDBG) administered by Washington's Office of Community Development. The City

of Redmond can apply for CDBG funds under the guise of the General Purpose Grant, the Planning-Only Grant, or the Community Investment Fund Grant to fund Mitigation Planning and projects.

Source: Municipal Research and Service Center website (http://www.mrsc.org)

1.3 Partner with the Redmond Chamber of Commerce and the Small Business Administration to plan and develop a Business Resource Center.

- The Resource Center can be an ongoing information clearinghouse for the business community. The Resource Center can build on the public outreach and educational efforts in action item 1.2, provide guidance in business resumption plan creation, identify fund programs for mitigation projects, and showcase cooperative agreements between large corporations and small businesses.
- The Resource Center can educate new businesses on the importance of business Mitigation Planning, help the City facilitate partnerships between large corporations and local small businesses, and encourage new businesses to adopt business Mitigation Planning in their day-to-day business operations.
- The Resource Center can work concurrently with the City to identify ways to complement each other rather than being repetitive. The City can allocate staff time to the planning, creation, and maintenance of the Resource Center.
- Funding for the planning and development of the Resource Center could come from Community Development Block Grants, Economic Development Grants, Small Business Administration Fund Programs, and private foundations.

1.4 Encourage large corporations to include their small business vendors and tenant businesses in their emergency management planning.

- As mentioned previously, large corporations benefit from having a variety of resources aimed at strengthening their resiliency to hazard events. Large corporations can share their resources, thereby increasing their economic resiliency in their vendors and tenant businesses through the following suggestions.
  - Include small businesses in training exercises. Many large corporations have office space that mimics the impacts of a hazard event (i.e., broken light fixtures, toppled shelves, etc.) to educate employees on evacuation and search and rescue techniques. Small businesses would benefit from training exercises that large corporations have to offer.
  - Facilitate a mentoring program between large corporations and small businesses. Knowledgeable corporate staff can guide small businesses to create resumption plans, identify appropriate insurance plans, and refer qualified professionals for building retrofits, etc.

1.5 Facilitate cooperative agreements between large corporations and local small businesses in a recovery scenario.

- The City can facilitate partnerships between large corporations and local small businesses by identifying shared risks and opportunities. Large corporations depend on local vendors for production and local small businesses depend on large corporation contracts for production as well.

- Given the shared risks, the City can facilitate cooperative agreements that result in shared opportunities. Cooperative agreements may comprise of the following key components.
  - Local small businesses would agree to develop business resumption plans, train employees, and perform structural and non-structural retrofitting to protect their people, assets, and business operations.
  - Large corporations would agree to provide facility space and essential business functions (phone, fax, computer, etc.) during a recovery period so that small businesses can recover quickly.

Goal 5: Reduce Isolation Resulting From Disruption to Lifelines and Infrastructure

Hazard events may disrupt Redmond's complex network of transportation and utility infrastructure on small and large scales, affecting daily activities and commerce in Redmond and the region.

Overview

This issue primarily deals with interruption by hazard events of proper function of transportation and utility infrastructure. Redmond's geography makes it dependent on a limited number of travel corridors to move people and goods on a regional basis, and it can be left isolated when those connections are lost. Disruption to utility service similarly may leave neighborhoods or sectors isolated within the City. Certain utilities pose a risk to life and property if disrupted, such as gas or fuel pipelines and power transmission centers. This chapter deals with utility service provision. High-risk utilities will be addressed further in the Hazards Presented by High-Risk Utilities and Facilities chapter.

The action items address the vulnerability of lifeline and infrastructure systems to disruption from hazard events and address the capability of responsible parties to respond to disruption. Natural hazards that affect lifelines and infrastructure include landslides, flooding, earthquakes, winter storms, and wildfire. Anthropogenic hazards such as terrorism present threats to these systems.

Transportation and utilities are both key components of lifelines and infrastructure for Redmond's residents and businesses. This section is divided as follows:

A. Transportation

B. Utility Service

C. General Lifeline and Infrastructure Response Capability.

A. Transportation

Transportation Overview

Redmond is a destination, a corridor, and a point of origin for the region's population. These transportation demands hinge on a properly functioning network of arterials and highways that connect Redmond to other regional centers. Properly functioning transportation systems support this important role in the regional economy. Key transportation routes that convey

populations between Redmond and neighboring jurisdictions include state routes, principal arterials, and minor arterials.

Redmond's economy depends upon population distribution and the transport and delivery of goods and services. Redmond supports several key economic centers throughout the jurisdiction, including Overlake Advanced Technology Center, Downtown Urban Center, southeast Redmond, and Willows Road. The City also supports a fine-grained distribution of small businesses through the City.

As transportation demands on Redmond's infrastructure increase, the impacts of transportation disruption are magnified. The Redmond Comprehensive Plan forecasts increases in arterial volume over the next ten years of 20-70%.

OBJECTIVES AND ACTION ITEMS FOR GOAL 5 - TRANSPORTATION

Objective 1

To reduce the disruption to transportation infrastructure from hazard events, Redmond should reduce the vulnerability of transportation infrastructure to hazard events.

Discussion

Two natural hazards present the most risk to the transportation systems: landslides and flooding (refer to Appendix D for flooding and landslide risk). These may occur as primary hazards, or they may be secondary hazards due to earthquakes and winter storm events. There is little ability to directly address the other natural hazards such as earthquakes, winter storms, or fire that may disrupt transportation. Preparation and response would be key for these, as addressed in objective 3 below.

Terrorism threatens transportation infrastructure directly (principal transportation routes may be a target) or indirectly (transportation infrastructure disrupted secondary to attack on economic or political target). There is little that may be done to mitigate the risk of either of these attacks. Again, preparation and response will be key.

The risk posed to specific roadways by each main hazard event is discussed below.

Landslides

- Transportation systems located under areas of steep slopes, vegetation, and within flood-prone locations may be vulnerable to disruption from landslide events, which may be a primary hazard or a secondary hazard of earthquake and flooding events.
- The key roads in Redmond vulnerable to these events include portions of Redmond-Woodinville Road, Avondale Road, Union Hill Road, Sahalee Way, East Lake Sammamish Parkway N.E., and West Lake Sammamish Parkway N.E.

Earthquakes

- Bridges present points of vulnerability during earthquake hazard events. Most bridges serving the downtown core have been retrofitted; the 116th Street Bridge and bridges east of town may continue to present vulnerabilities.

- Road surfaces may experience substantial shift due to ground shaking and liquefaction, but this is unpredictable and would be addressed post-event. Disruption due to road failure may be widespread, but may be addressed through preparation and response mechanisms.
- Disruption from flooding and landslide hazards would be the most common secondary hazards of an earthquake event.

Flooding

- Minor nuisance flooding in Redmond characterizes the flooding hazard. Sources of flood events include streams, wetlands, and drainage infrastructure particularly in areas with changing character of development. Flooding may occur along Bear Creek and Evans Creek, particularly east of Redmond along SR 202 and in isolated neighborhood drainages.
- The Sammamish River has not presented flooding problems since its canalization in the 1960s. Backwater flooding from drainage infrastructure may present isolated occurrences of flooding along the Sammamish River.
- All of these flooding events present isolated points of disruption that may require local detours. Flooding along main roads presents the most impact on transportation infrastructure. Redmond-Fall City Road (SR 202) experiences regular flooding events during high rain periods, but no other main roads in Redmond appear to have regular flooding disruption.

Winter Storms

- Widespread traffic disruption may occur from winter storms. The primary sources of disruption would be from downed trees and utility lines and from unsafe roadway conditions. Little advance mitigation is possible except to decrease amounts of vegetation around vulnerable utility lines or roads or to ground utility lines.

Terrorism

- Terrorist acts may directly or indirectly affect transportation corridors. The most vulnerable locations would be main corridors (highways and arterials) that carry high volumes of commuters and products or primary roads associated with economic centers.
- The roads that serve the neighborhoods classified as "Urban Center (City Center)," "Advanced Technology/Activity Center (Overlake)," and "Research and Development, High Technology, and Manufacturing" are highly vulnerable to disruption from terrorism. These include SR 520 and Bell-Red Road in Overlake, SR 520 and surface roads through the City Center, Willows Road (Willows area), 148 Avenue N.E., N.E. 40 Street (Overlake), Union Hill Road, and Redmond-Fall City Road (southeast Redmond).

Action Items

1.1 Cooperate with neighboring jurisdictions and planning and transportation agencies to harden vulnerabilities of transportation routes. Regional planning should reduce transportation disruption between jurisdictions. The inter-connection of businesses and transportation networks in this region amplifies the effects of disruption of goods and

commuters across the region. Adjacent jurisdictions, the county, and the state must coordinate prevention and response to transportation disruption from hazard events on all scales.

- Identify and prioritize regional transportation corridors in order of their respective importance to community and business continuity throughout the region. Focus should be on key inter-local thoroughfares and regional transportation systems. The inter-jurisdictional arterial network represents an important supplement to highway capacity throughout eastside cities.
- Identify and prioritize key vulnerabilities of regional transportation routes. Prioritize the vulnerabilities based on importance of the disrupted route, the scale of the potential disruption, and the effectiveness of mitigation investments.
- Develop a strategy to harden transportation vulnerabilities on a regional basis, based on the prioritization of routes and vulnerabilities. In addition to addressing the hazard and the vulnerability, this may include identifying appropriate responders and establishing detour routes on a regional scale to expedite response to hazard events.
- The extensive research of the Eastside Transportation Partnership to identify regional priority road improvements provides key groundwork for this project. ETP's Mobility Action Priorities has identified regional priority routes and improvements. This action item would add the consideration of roadway vulnerabilities (landslide-prone slopes, frequently-flooded areas, seismic retrofitting, etc.) and disaster-response contingency plans (detour routes and response Strategies to the existing comprehensive analysis that has already been performed.

- The collaborative ETP framework brings together regional leaders of jurisdictions and agencies and provides a natural framework for further action. The City of Redmond is already engaged in transportation planning efforts in an intra-city and a regional context and has engaged neighboring jurisdictions and agencies in these efforts.
- Pending entry into a regional planning effort, Redmond may begin by comprehensive analysis and prioritization of vulnerable roadways within their jurisdiction and contingency planning with detour routes and response Strategies.
- Additional contributions of road priority research, of road vulnerability research, and of existing regional networks may come from Project Impact, Pillars transportation research, King County Transportation Coalition, Seattle Transit Initiative, and Puget Sound Regional Council.

1.2 Reduce vulnerability of key transportation routes within Redmond to natural hazard events. The key transportation routes that may be vulnerable to flooding and landslides include portions of Redmond-Woodinville Road, Avondale Road, Redmond-Fall City Road, Union Hill Road, Sahalee Way, East Lake Sammamish Parkway N.E., and West Lake Sammamish Parkway N.E.

- Prioritize vulnerable transportation systems (see 1.1 above). Address vulnerabilities based on prioritization.
- Mitigate unstable slopes through re-vegetation, structural measures, drainage improvements, and development restrictions as appropriate to the situation. Mitigate sources of flood events in ways that preserve natural channels and flows

as much as possible but that reduce the hazard risk through increased storage capacity, altered stream structure, or channel dynamics. Unstable slopes that threaten roads may also pose a risk to streams or wetlands at the toe and could represent a common goal for the transportation and natural resources groups.

- These assessments and mitigation approaches must be performed within the City of Redmond and in neighboring jurisdictions. Responsible agencies include Redmond's transportation and natural resources divisions of Public Works, King County Roads, WSDOT, and neighboring Public Works Departments among other agencies.

1.3 Perform seismic upgrades of bridges and roadways.

- Seismic retrofitting of bridges. Bridges that have not been retrofitted should be identified and retrofitted on an accelerated schedule. This may be part of a regional earthquake-retrofitting program administered by such organizations as Project Impact.
- Preventative road maintenance should improve road surfaces and sub-grade as necessary to promote stable roads through earthquake events. Roads in seismic or landslide hazard areas subject to liquefaction may be particularly vulnerable to disruption.

1.4 Increase travel route redundancy.

- Increase redundancy in routes and capacity to preserve travel patterns in the event of localized disruption. Identify alternative routes prior to events to enable rapid response.
- Increasing roadway capacity on alternate routes can decrease congestion in the event of traffic diversions. Capacity increases should be pursuant to previously identified transportation improvements in the capital facilities plan. Analysis of hazard mitigation needs for capacity and redundancy may allow re-prioritization of scheduled capacity capital improvements.

1.5 Support transit systems through transportation improvements.

- Transit systems may experience disruption during hazard events. These systems will usually rely on the high-priority roads for travel and, therefore, will be indirectly addressed through the above action items. Short-term displacement of transit-dependent workers should be addressed through the Community Resiliency to Large-Scale Regional Events section.

B. Utility Service

Utility Service Overview

Redmond's utility infrastructure has numerous independent source and distribution systems. The City, private or quasi-public utility companies, neighboring jurisdictions, the county, and the state provide services. This section describes utility infrastructure. Vulnerabilities and action items will be discussed in the following section.

Water

Redmond relies on groundwater wells for approximately half of its water source, supplying residents on the east side of the Sammamish River. The Tolt River (City of Seattle source) supplies water to residents west of the Sammamish River either directly through the Redmond system or indirectly through Bellevue and Kirkland water systems.

There are five main water distribution areas in Redmond. The main groundwater well service area is the portion of Redmond east of the Sammamish River and north of SR 520. The Overlake and Viewpoint service areas have un-metered connections to a joint-use pipeline owned by Redmond and Bellevue and connections to the Redmond Water System. The Redmond Water System also serves the Rose Hill area and Redmond Ridge.

Redmond's wells are located in the east side of the City. Well 3 is in a septic-system-dominated area. Wells 1, 2, 4, and 5 are located in Redmond's central commercial districts that are continuing to develop within the aquifer recharge areas for these wells. Approximately one-half of Redmond's water is derived from the City of Seattle Tolt Water System.

Electricity

Electricity service comes from Puget Sound Energy. The transmission center is located in west Redmond off of 132 Avenue N.E. and distributed throughout the City. This City of Redmond transmission center is the primary transmission center for the entire region. Disruption of this transmission center would have ramifications for tens of thousands of businesses and residents throughout the region. The High-Risk Utilities and Facilities chapter will address the transmission center as a high-risk facility in the Hazards Presented section.

Telecommunications

Telecommunications facilities are distributed throughout the City. Cell phone towers and remote telephone switches are located throughout the City and the neighboring areas. Most major arterials within Redmond provide conveyance for major telephone feeder or cable trunk lines. Fine-grained networks distribute services from these main lines to neighborhoods and economic centers.

Natural Gas

Natural gas is supplied through the Northwest Gas pipeline running east of the City through the City of Redmond watershed and Union Hill. The main distribution point is the Redmond Gate Station on Union Hill Road. High-pressure gas mains convey natural gas along Union Hill Road, Avondale Road, and 148 Avenue NE. Puget Sound Energy owns and maintains the natural gas pipelines. The High-Risk Utilities and Facilities chapter will address the gas lines as a high-risk facility in the Hazards Presented section.

Olympic Pipeline

The Olympic Pipeline runs parallel to 134 Avenue N.E. on the west side of Redmond. It is part of a 400-mile fuel pipeline that spans Washington and Oregon. The High-Risk Utilities and Facilities chapter will address the pipeline as a high-risk utility in the Hazards Presented section.

Sewer

Wastewater service is provided by the King County METRO system, administered by King County, and piped to Seattle for treatment. Pump stations and facilities are located throughout the City. The METRO transmission line runs along West Lake Sammamish Parkway, Redmond-Fall City Road, north along the Sammamish River, and west along NE 124 Street.

A few areas of Redmond (along the Sammamish River and in north and east Redmond) and most proposed annexation areas are on septic systems. Future extension of infrastructure to these areas will rely on the METRO system for treatment. At present, education and assistance by the City should ensure proper maintenance, operation, and gradual phase-out of these septic systems.

Waste Management

Redmond relies on private companies for collection and on King County for transport and storage of the City's solid waste.

OBJECTIVES AND ACTION ITEMS FOR GOAL 5 - UTILITY SERVICE

Objective 2

To minimize utility service disruption from hazard events, the City of Redmond should reduce the vulnerability of utility production and distribution systems.

Discussion

Risk to utility infrastructure may be specific to each type of utility. Most utilities rely on a main hub and a distribution network, each of which is vulnerable to different types of disruption. Certain utilities, such as natural gas lines, the Olympic Pipeline, and the electricity transmission center, may represent a hazard in and of themselves as will be discussed in objective 3.

The following section discusses the respective vulnerabilities of utility systems as it relates to proper utility service and makes subsequent action items for each system. It is important to prioritize vulnerable systems in order of their respective importance to community and business continuity. Focus should be on regional utility systems and service to key economic centers. Mitigation measures may target the hazard (i.e., reducing landslide risk that threatens vulnerable power lines) or target the utility (i.e., grounding the vulnerable power lines).

Action Items

2.1 Reduce the vulnerability of utility infrastructure, hubs and distributions systems.

- Protect hubs from natural and anthropogenic hazards. This may include structural retrofitting, addressing landslide hazards, moving highly vulnerable hubs to less hazardous locations, restricting access, moving to locations with more alternative transportation access routes, and creating a fire-defensible space around the centers.
- Assess and ensure redundancy in utility systems. This can help reduce overloading and provide back-up sources of service. This may be done through public/private partnerships for corporate entities.

Utility-Specific Vulnerabilities

Water

- There is a risk of contamination to Redmond's groundwater systems from polluted surface water, ground water, or hazardous material spills. Increasing levels of imperviousness in aquifer recharge areas may contribute to depleted groundwater resources. Issues such as contamination and aquifer recharge are being addressed through the City of Redmond's inter-departmental Wellhead Protection Program. The source and distribution lines of the groundwater system may both be vulnerable. Water storage tanks are located on the periphery of western Redmond and within eastern Redmond. Storage tanks may be jointly owned with other cities.
- The distribution line represents the main vulnerability for the Tolt system. The City's groundwater distribution pipelines are equipped to re-distribute well water to the Tolt service area, although this has not been tested. The groundwater system is supplemented with Tolt water during the dry summer months.

Utility-Specific Action Items:

Water

2.2 Ensure adequate function of citywide Tolt water distribution.

- Perform a test re-distribution of the City's drinking water supply in the event of contamination of groundwater. This would involve a temporary diversion of the City of Seattle Tolt drinking water system to the areas supplied by Redmond's groundwater.

2.3 Preserve the open and uncontaminated state of key aquifer recharge areas.

- Wellhead protection guidelines help prevent contamination or reduced recharge to this portion of the City's drinking water. These guidelines are in the final stages of development at the time of writing.

Utility-Specific Vulnerabilities

Wire-Dependent Utilities (electricity, telecommunications)

- The Puget Sound Energy transmission center serves the entire region. The local economy depends on adequate function of this power distribution center.
- The distribution network represents a vulnerability of the system. Overhead distribution lines and vegetation make the older parts of Redmond more vulnerable to electricity disruption. These areas include parts of eastern Redmond such as Rose Hill and Education Hill. Redmond requires linear distribution systems to be buried in association with new development.
- Puget Sound Energy has worked closely with the City to improve grid transmission, prune trees around power lines, and bury power lines in older neighborhoods, resulting in a marked decrease in power disruption to communities. Puget Sound Energy also works closely with its main corporate customers in Redmond to ensure proper restoration and maintenance of electricity in the event of power disruption.

Utility-Specific Action Items:

Wire-Dependent Utilities

2.4 Assess the vulnerability of the electricity transmission center.

- The main risk of electricity service disruption is from the transmission center as a potential target. Vulnerabilities surround such issues as access, security, or building design. The main natural hazard disruption would be earthquake damage. This is addressed further in the Hazards Presented by High-Risk Utilities and Facilities chapter.
- Given the importance of electricity service to the local economy, the City of Redmond Fire Department or Emergency Services may work out a response plan with Puget Sound Energy to provide early responder services there in the event of any hazard.

2.5 Reduce the vulnerability of wire-dependent utility systems.

- Bury linear distribution systems (wire- or pipeline-dependent utilities). Redmond should adopt an incentive program to encourage utility companies to bury utilities (i.e., expedited permits, shared projects costs for joint construction efforts (roads and utilities cooperation).
- Prune vegetation around distribution lines to minimize the chance of disruption from falling trees (from landslides or winter storms) and wildfire. Puget Sound Energy has an aggressive pruning protocol to protect aboveground power lines. Further public education could reduce the likelihood that citizens will plant vegetation near power lines.

Utility-Specific Vulnerabilities

Natural Gas and Olympic Pipelines

(Please refer to Hazards Presented by High-Risk Utilities and Facilities chapter.)

Utility-Specific Vulnerabilities

Wastewater

- Wastewater collection and treatment systems present a hazard of spill or accumulation of volatile materials along their collection lines and central treatment facilities. Redmond relies on King County METRO to maintain and preserve the sewage system. These lines are buried and represent minimal risk of breakage except in cases of earth movement.
- In the remaining septic-served areas, education and assistance by the City should ensure proper maintenance, operation, and gradual phase-out of the systems.

Utility-Specific Action Items:

Wastewater

2.6 Identify and mitigate points of vulnerability for sewer infrastructure.

- Work with King County/METRO to identify vulnerabilities of sewer pipelines. This is of particular concern where sewer pipelines travel along the Sammamish or near neighborhoods and where pipelines may be above ground. King County may have performed a vulnerability assessment following the Nisqually earthquake. These vulnerabilities should be identified and appropriately mitigated.

Utility-Specific Vulnerabilities

Waste Management

- Collection and storage capacity may be limited after a hazard event. A regional hazard may produce large amounts of debris and delay response time so as to impede proper collection and require expenditures for excessive storage, collection, and transport of debris material.

Utility-Specific Action Items:

Waste Management

2.7 Prepare for adequate waste storage and management in response to a hazard event.

- Identify possible storage areas for debris and waste that may accumulate during a regional event (i.e., publicly-owned vacant lots or parking areas, parks where environmental impacts would be minimal). Prepare a strategy that separates debris in ways that facilitate recycling and proper disposal upon resumption of service.

C. General Lifeline and Infrastructure Response Capability

General Response Capability Overview

A combination of local, neighboring, jurisdictional, county, and state agencies, along with private and quasi-public utility companies, hold responsibility for the maintenance of transportation and utility infrastructure. Of particular importance to restoring disrupted service are public governmental agencies and first responders.

OBJECTIVES AND ACTION ITEMS FOR GOAL 5 - GENERAL LIFELINE AND INFRASTRUCTURE RESPONSE CAPABILITY

Objective 3

Ensure adequate public sector, inter-jurisdictional, and private sector response capability to overall infrastructure disruption.

Discussion

Utility and transportation responders should be fully prepared and equipped for rapid response to restore function to communities and businesses in vulnerable areas (response to traffic lights, power outages, road closures, etc.).

During a small-scale or a catastrophic localized event, Redmond can rely on adequate numbers of personnel and response assistance from the responsible parties. A large-scale regional earthquake would strain response capacity within Redmond and across the region. This is addressed more directly in the Community Resiliency to Large-Scale Regional Events section.

Action Items:

3.1 Ensure public sector response capability.

- First responder systems are of primary importance, but similarly important are Public Works and Utility crews who will respond to infrastructure disruption. Response may be compromised by loss of power or ingress/egress routes in the vicinity of response teams. Redundancy in location, infrastructure, and alternative transportation routes for these key responder units.
- Key operations centers and response team headquarters should be moved out of vulnerable areas (particularly seismic hazard areas). This is addressed further in Community Resiliency to Large-Scale Regional Events.
- Ensure that all appropriate public response departments and units have comprehensive maps of the locations and shut-off points of high-risk utilities. Work with appropriate utility and public departments to develop coordinated response plans to address risks to life, property, and community/economic infrastructure. The High-Risk Utilities and Facilities section addresses this further in Hazards Presented.

3.2 Develop response strategies based on route priorities.

- Plan for rapid and direct response to transportation disruption on the key transportation corridors and product supply/delivery routes that Redmond's large corporations rely upon for business continuity.
- Identify key transportation corridors vulnerable to hazard events. This should include a standing prioritization of the most important roads, systems, or neighborhoods for response in the event of widespread disruption.

3.3 Strengthen private sector role in response capability.

- Promote communication and cooperative planning between corporations and businesses that work closely with one another and rely on communication and transportation systems for their joint business interests. Strategic planning between business partners can help overcome infrastructure disruption. The Chamber of Commerce or other business associations may facilitate these connections.
- Neighborhood and business preparation for post-hazard isolation and response can help alleviate the burden on public agency response capability.

Goal 6: Reduce Hazards Presented By High-Risk Utilities and Facilities

Certain high-risk utilities and facilities may present a hazard to Redmond's citizens, businesses, and property, should these utilities be disrupted during a hazard event.

Overview

The Olympic Pipeline, natural gas pipelines, the main power transmission center for Puget Sound Energy, and hazardous chemical storage sites represent the four main high-risk utilities or facilities in the City of Redmond. Other utilities may present a secondary hazard under certain circumstances (contaminated drinking water, downed power lines, or broken sewer main). The hazard presented in these cases is generally smaller and is addressed in the previous Isolation Resulting from Disruption to Lifelines and Infrastructure section.

Olympic Pipeline

- The Olympic Pipeline runs parallel to 134 Avenue N.E. on the west side of Redmond. It is part of a 400-mile fuel pipeline that spans Washington and Oregon (refer to Olympic Pipeline map in Appendix E).
- The pipeline runs through large sections of western Redmond mapped as landslide or erosion hazards. The pipeline is located above Willows Road N.E./140 Avenue N.E. Areas that are mapped as landslide hazards are located between N.E. 85 Street and N.E. 124 Street in the vicinity of N.E. 126 Place, and N.E. 137 Place through the northern City limits. A large number of residential and commercial properties are located in this vicinity and would be vulnerable during a hazard event that involved these pipelines. The pipeline is buried through most of its length but is exposed in places.
- Many of the landslide areas crossed by the pipeline are the headwaters for seeps and streams in western Redmond, making not only these stream systems but also the confluent Sammamish River vulnerable to contamination.
- Redmond is working on a response plan to deal with Olympic Pipeline hazard events. The managing company and the City of Redmond have a working relationship. The Redmond Fire Department is trained with regard to shut-off valves and response procedures in the event of disruption to the pipeline.

Natural Gas Pipelines

- The Northwest Gas pipeline runs east of the City through the City of Redmond Watershed and Union Hill. The main distribution point is the Redmond Gate Station on Union Hill Road. High-pressure gas mains convey natural gas along Union Hill Road, Avondale Road, and 148 Avenue N.E. Gas lines are buried for the most part.
- Certain portions of natural gas pipeline routes are near landslide hazards. High-pressure natural gas mains run along Union Hill Road, 148 Avenue N.E., and Old Redmond Road. Portions of these routes are near the toe of mapped landslide hazard areas. As with the Olympic Pipeline, residential and commercial properties would be vulnerable during a hazard event.
- Puget Sound Energy coordinates with Redmond Fire Department on response, holding bi-annual trainings and educating local personnel on the workings of the pipeline. The Redmond Fire Department responds to many small gas leaks every

year, often due to accidental encroachment on the pipeline by landowners unaware of its presence. Redmond would rely on PSE response teams in the event of disruption to the Northwest Gas Pipeline.

Power Transmission Centers

- The transmission center is located in west Redmond off of 132 Avenue N.E. and distributed throughout the City. This City of Redmond transmission center is the primary transmission center for the entire region.
- Power transmission centers represent specific points of high risk, presenting a risk of fire to the surrounding vicinity should it be the target of a terrorist action.

Hazardous Chemical Storage Facilities

- Hazardous chemical storage facilities are distributed at a number of locations throughout the City, concentrated mostly in commercial areas. The Unisea seafood processor is ranked by the Redmond Emergency Management Department as the highest concern due to high amounts of anhydrous ammonia at the site. A number of other chemical sites may also pose significant risk to the community.
- The City has documentation of hazardous chemical storage sites that report to the King County Local Emergency Planning Committee. Redmond tracks hazardous material storage sites as reported under LEPC.
- Current Groundwater Protection Ordinance planning in the aquifer recharge areas (most of central Redmond) may require an inventory of all hazardous chemicals, operations plans, performance standards compliance, and certain other permits and requirements based on the location of the business and type of chemical at the site. This work is still in draft form and will continue to work to establish best management practices and location guidelines.

OBJECTIVES AND ACTION ITEMS FOR GOAL 6

Objective 1

To reduce the risk posed by high-risk utilities and facilities and address the vulnerability of these systems.

Discussion

All of these action items should be performed in cooperation with the Redmond Fire Department, Public Works Department, and local or regional public and private utility companies.

Action Items:

1.1 Reduce the risk surrounding an Olympic Pipeline rupture.

- The Olympic Pipeline runs along landslide-prone slopes for much of its length through Redmond. Slopes must be assessed for stability, restoration and re-vegetation needs, and needed drainage improvements. Strict site design, storm water drainage, and vegetation retention standards shall be applied to these areas

to preserve slope stability. At areas of vulnerability to landslides, sensors triggered by slope movement could provide an early warning system for response. Identify areas where the Olympic Pipeline is exposed above the ground and explore possibilities of burying pipeline.

- Strengthening the structure and integrity of all high-risk utility systems and high-risk facilities may include such measures as:
  - Increased frequency of shut-off valves.
  - Remotely located control capabilities.
  - Structural retrofitting of these high-risk systems.
  - Restriction of access.
  - Adequate signage all along pipelines to prevent accidental disturbance.
  - Frequent inspections to ensure compliance with safety/performance standards.
  - Relocation to minimize the property and residents vulnerable to these hazards.
- Identify response capabilities. Redmond has completed a response plan to deal with Olympic Pipeline hazard events. The managing company and the City of Redmond have an excellent working relationship. The Redmond Fire Department is trained with regard to shut-off valves and response procedures in the event of disruption to the pipeline. Further coordination of protocols and capabilities continue and will improve response.
- Public education to notify local citizens of the presence of a high-risk utility or facility in their neighborhood will improve the preparation and response by local residents. Education priorities include detecting warning signs, knowing appropriate contacts in the event of an emergency, understanding site-specific concerns, and knowing evacuation routes.
- Redmond and the Olympic Pipeline Company have information about the location and vulnerabilities of the route. Redmond will evaluate performing a more extensive analysis of the pipeline route including GIS assessment of parcels, drainages, ownership, and flow routes, field assessments of vulnerabilities, and work with neighboring jurisdictions on cross-border reduction of vulnerabilities and on response.

1.2 Reduce the vulnerability of high-risk utility and facility infrastructure to hazard events in order to reduce the risk to life and property of Redmond's residents and businesses.

- Assess slope stability, landslide vulnerability, and exposure of high-risk utility and facility structures.
- Strengthen the structure and integrity of all high-risk utility systems and high-risk facilities, including such measures as referred to in action item 1.1 above.

1.3 Ensure adequate response capability

- Redmond and the pipeline companies have established response protocols. Ensure that post-event protocols are also fully developed, including protocols for cleanup and disposal of waste.

- Private companies primarily operate high-risk chemical storage facilities. Emergency response protocols should be fully coordinated with the Fire Department and first responders. Clear protocols for response by private and public agencies must be addressed and established.
- Please refer to objective 3 in the Isolation Resulting from Disruption to Lifelines and Infrastructure section for further action items about inter-jurisdictional and private sector response.

1.4 Educate neighboring residents about hazard and associated risks.

- Public education to notify local citizens of the presence of the high-risk utility or facility in their neighborhood will improve the preparation and response by local residents. Additional public education must be explored through local community groups, neighborhood associations, and homeowner/apartment associations. Information may be provided through property purchase disclosure requirements.
- Residents play an important part in detecting the first signs of high-risk utility or facility disruption (i.e., detection of chemical or natural gas odor). With buried pipelines, neighbors may be unaware or unconcerned about the risk posed by the utility. Education and preparation will be very valuable training for all parties. Education priorities include detecting warning signs, knowing appropriate contacts in the event of an emergency, understanding site-specific concerns, and knowing evacuation routes.

Goal 7: Preserve and Enhance the Natural Environment

Future regional growth may alter hydrologic processes in Redmond's stream, wetlands, and sub-surface water systems. This may increase the risk of flooding or landslides to Redmond's residents, structures, and infrastructure. Appropriate development within and outside of Redmond can help protect life and property from hazard events while preserving the integrity of Redmond's valued natural systems.

Overview

Redmond faces a relatively small risk of flooding and landslide events at this time; however, Redmond's sixteen-square-mile area is a small part of the Bear Creek/Evans Creek Basin and the Sammamish River Watershed. Just as Redmond is developing rapidly within its boundaries (the Comp Plan forecasts 15,600 more residents between 1995 and 2012), growth is modifying large areas upstream of Redmond in the Bear Creek and Evans Creek corridors.

Development increases levels of impervious surface, degrades stream structure, and compromises natural vegetation and soil structure. The resulting altered storm water delivery patterns can change the frequency, severity, timing, and probability of flooding and landslide events. These changes can present a risk to life, property, and daily function for Redmond residents. The 1989 Bear Creek Basin Plan forecasts a loss of 18,000 acres of forest and 1,300 acres of wetlands to development. There will be an inevitable expansion of the 100-year floodplain as upland development aggravates flooding and drainage conditions downstream and down slope.

Although Redmond has a comprehensive set of development standards that hold new development to rigorous environmental and storm water protections, its position at the mouth of

the sub-basin and its topographic setting subject it to hydrologic changes from upstream development.

OBJECTIVES AND ACTION ITEMS FOR GOAL 7

Objective 1

To protect the future quality of life and environment for its residents, the City of Redmond should reduce vulnerability to changing hazard regimes.

Discussion

Densification in an urban setting presents a number of challenges: to adequately mitigate the impacts of development on surface water and storm water delivery, to direct development away from sensitive areas in order to protect these resources and reduce the risk of damage to life and property from changing hydrologic regimes, and to preserve the high quality natural environment that is valued by the City and its citizens.

Areas that may be marginally vulnerable to hazard events may become increasingly vulnerable as hydrologic and development conditions change over time. Redmond should monitor and respond to these conditions, integrating preventative and restorative action items as appropriate.

Planning policies that preserve key habitat elements and direct capital expenditures for habitat restoration may contribute to the goals of reducing risk from natural hazards. Redmond's strict storm water infrastructure standards help new development contain and mitigate the effects of runoff from impervious surfaces on the environment. Comprehensive plan and development regulations protect natural systems through impact fees, permit conditions, site design requirements, storm water standards, restricted slope development, native vegetation protection measures, tree preservation ordinances, and critical area regulations.

Many older residential and commercial areas of Redmond do not support adequate storm water infrastructure, including the downtown City Center. These areas are being retrofitted to introduce adequate storm water storage capacity in association with new development. On a site-by-site basis, the Public Works Department addresses drainage issues as they arise.

Action Items:

1.1 Restore natural drainage capacity and structure of streams and wetlands to address future changes in flows.

- Restore stream and wetland structure and capacity. This should include key habitat elements along Bear Creek, in partnership with King County and other jurisdictions and as identified in guiding Bear Creek habitat analyses. Natural stream and wetland systems should be protected and restored to full capacity and function in order to capitalize on natural drainage systems.
- Cooperation between the Natural Resources and Public Utilities/Storm Water Departments to coordinate Public Works drainage projects with stream and wetland restoration goals. Restoration of stream integrity can reduce the occurrence of flooding on current and future developments.

1.2 Identify areas of opportunity for stream and floodplain restoration following hazard events.

- The amount of flooding that causes direct property damage is limited in Redmond, but certain properties may provide important areas to target for buyouts and restoration using post-disaster recovery money.
- Properties could be restored for off-channel storage capacity. Improving floodplain storage may decrease the incidence of nuisance flooding and may be important hydrologic infrastructure to buffer future floodplain increases.

1.3 Identify areas of opportunity for storm water retrofitting to maximize drainage infrastructure.

- Periods of re-development, such as post-earthquake recovery, road reconstruction, utility grounding, and extensive new development projects, provide opportunities for storm water retrofitting. Older neighborhoods of Redmond such as the Old Town City Center lack adequate storm water infrastructure and may experience more frequent incidents of flooding as development increases the surrounding levels of imperviousness.
- Identify neighborhoods that lack adequate storm water infrastructure. Once the need is identified and planned, retrofitting may be scheduled with Capital Improvement Plan activities or may be implemented during post-hazard recovery. Refer to Long-Range Recovery Plan for Redmond's Old Town District for additional information.

1.4 Target landslide-prone areas for pre- or post-event restoration and acquisition.

- Identify areas at risk from landslide events and evaluate the possibilities for pre- and post-event buyout of properties with high vulnerability. Future restoration may stabilize these sites and reduce the vulnerability of surrounding properties.
- Local Improvement Districts may be organized with local landowners to finance slope stabilization projects and hydrologic improvements in slide-prone areas. These may be organized through public outreach by the City of Redmond to organize community initiative and response.

1.5 Pursue public land acquisition strategies and landscape-level habitat coordination efforts.

- Build partnerships through inter-local agreements and watershed action plans between Redmond, neighboring cities, and King County. Work to direct and design future development to preserve the integrity of natural systems and minimize aggravating factors that affect the occurrence of natural hazards. Coordinate sensitive area regulations to provide consistency between jurisdictions. Utilize GIS and modeling capabilities to identify the points in the watershed that contribute the most to hydrologic stability and prioritize protection accordingly.
- Investigate development right transfers that recognize hazard-prone areas as appropriate and priority sending zones for development rights. Regulations may specifically encourage this type of program to promote enrollment of lands in hazard-prone areas.
- Develop partnerships between the City of Redmond Parks, Planning, and Natural Resources Departments to preserve landscape features that are prone to natural

hazard events or that contribute to the stability of natural systems. These may include:

- Historic agricultural floodplains along Bear Creek/Evans Creek and the north Sammamish Valley. Historic farms and rural areas in the floodplain provide excellent opportunities for historic preservation, public park use, and floodplain storage.
- Landslide-prone slopes. These acquisitions are particularly important after slides have occurred to reduce risk to life and property.
- Fee-simple acquisition, conservation easements, development right transfers, and current-use taxation programs are appropriate methods of land protection.

Goal 8: Reduce Vulnerability of Historic and Cultural Resources

Old Town is a community and regional asset and merits a community-wide approach to reduce the impacts of hazards.

Overview

Old Town - Historic Design Sub-Area and Redmond Hazard Areas

The sub-area boundaries are N.E. 80 Street to the north, 160 Avenue N.E. to the east, 164 Avenue N.E. to the west, and Leary Way and N.E. 76 Street to the south. The sub-area is located in the City Center/Downtown neighborhood. The sub-area contains many historic landmarks that are valuable historic and cultural resources in the City of Redmond and in the greater King County region. The Sub-area is located in Redmond's Seismic Hazard Area, and several historic properties are located within Redmond's 100-Year floodplain. Historic landmarks in these hazard areas are vulnerable to a variety of hazards, namely earthquakes and flooding, as well as secondary hazards such as fires and landslides. Refer to the Redmond Flooding - Historic Sites/District Map (Appendix F), Redmond Seismic Hazard - Historic Sites/District Map (Appendix G), and the Historic Design Sub-Area Boundaries Map (Appendix H).

Designated Historic Landmarks and Existing Conditions

Currently, Redmond has 16 historic landmarks and sites, plus 14 properties and four sites that are largely designated as rural/agricultural. A majority of Redmond's historic landmarks were built between 1890 and 1910 and are located in Old Town. About half of the buildings are wood-frame, while the remaining buildings are masonry – some of which are un-reinforced masonry. Given the age and construction of these properties, these properties most likely would not withstand a large-scale hazard event such as a severe earthquake. Wood-frame properties that are not bolted to their foundations and un-reinforced masonry properties will experience significant structural damage. Additionally, some of these historic landmarks lack fire response systems and adequate drainage systems given their age. These existing conditions cast additional vulnerability to historic properties. Source: Redmond Comprehensive Plan, February 15, 2002, and April 19, 2002 communication with Dianna Broadie, Planner, Redmond Department of Planning & Community Development.

Potential Historic Landmarks

Currently, there are over 75 potential landmarks concentrated in the City Center/Downtown neighborhood. These potential landmarks add value to the overall community character downtown and are also vulnerable to earthquakes, given their location in Redmond's Seismic Hazard Area. These potential landmarks would affect downtown if destroyed. Source: April 19, 2002 communication with Dianna Broadie, Planner, Redmond Department of Planning & Community Development.

Previous Occurrences with Hazard Events

A fire in the early 1900's damaged several wood-frame properties in the area. After the fire, people began to construct masonry buildings to protect properties from the impacts of future fires. Those wood-frame buildings that survived the 1900's fire event remain vulnerable to fires today.

There was almost no adverse impact from the February 28, 2001 Nisqually Earthquake. Little mortar dust was found and the only structural failure involved a chimney located in Conrad Olsen Park, a designated historic site. The Nisqually Earthquake was largely geographic specific to areas west of Lake Washington, namely Olympia, Tacoma, and Seattle, and ground shaking as a result of the earthquake was minimal in Redmond. A similar type of earthquake or a larger scale earthquake occurring in Redmond would cause significant structural damage to historic landmarks and potential landmarks. Source: April 19, 2002 communication with Dianna Broadie, Planner, Redmond Department of Planning & Community Development.

Vulnerability of Transportation Networks and Small Businesses in Old Town

Cleveland Street and Leary Way are key arterials that allow many people to move through the sub-area. Leary Way can be used to reach Redmond Town Center and those traveling east through the sub-area can use Cleveland Street. There are several historic landmarks that are located along these two arterials. As mentioned previously, several historic landmarks will not withstand a large-scale hazard event such as a severe earthquake, and building debris in the arterials would disable Old Town's transportation networks. Refer to Historic Design Sub-Area Map (Appendix H).

There are many small businesses unique to downtowns that are housed in historic landmarks. These small businesses would experience adverse impacts in a hazard event if: 1) the property that houses their businesses is not retrofitted to withstand significant structural damage, and 2) the small business lacks a contingency plan focused on resuming business operations after a disaster occurs. In addition, many small businesses and/or property owners do not have funds to retrofit their properties, lack the knowledge to lead a retrofit project, and may not see the economic and cultural benefits of retrofitting.

Rapid Screening Procedure (RSP)

The Federal Emergency Management Administration (FEMA) issued the RSP and uses a methodology based on a "sidewalk survey" of a building and a Data Collection Form, ATC-21, which a person completes based on visual observation of the building. FEMA encourages local jurisdictions to use the RSP method to begin a local retrofitting program.

In 2000, students from a University of Washington Urban Planning Studio completed ATC-21 forms for many historic landmarks and potential landmarks located in Old Town and in the

greater City Center/Downtown neighborhood. Students surveyed un-reinforced masonry properties, wood-frame properties, and masonry properties.

The findings show that un-reinforced masonry buildings scored less than 1, reinforced masonry buildings received a score of 2, and wood-frame buildings averaged a score of 3. These scores were calculated utilizing the ATC-21 form. The numerical scores denote the approximate level of seismic performance of a property, although an in-depth inspection conducted by qualified seismic engineers is encouraged. Scores typically range from 0 to 6, with higher scores corresponding to better seismic performance.

Refer to Appendix J for a summary of the RSP and completed copies of the ATC-21 forms. Source: Federal Emergency Management Agency. FEMA 154/July 1988. Rapid Visual Screening of Buildings for Potential Seismic Hazards: A Handbook.

Work in Progress

In late 2001, City staff proposed a comprehensive set of incentives that could provide assistance for property owners to bring their masonry structures up to existing code. City staff is also working to present information regarding an Inter-Local Agreement with King County. Partnering with King County will allow the City to access a broader range of funding sources for retrofitting historic landmarks. Currently, there are few City-sponsored plans and/or programs that address hazard mitigation strategies focused on historic and cultural resources. Source: February 15, 2002 and June 7, 2002 communication with Dianna Broadie, Planner, Redmond Department of Planning & Community Development.

OBJECTIVES AND ACTION ITEMS FOR GOAL 8

Objective 1

Retrofit designated historic landmarks.

Discussion

Historic landmarks are valuable community and regional assets. Historic landmarks contribute cultural and historic significance, cultivate character and sense of place in Redmond, and house one-of-a-kind businesses in the midst of a growing City encompassed by high-technology and biomedical corporations. Historic landmarks contribute to Redmond's high quality of life and are of immense community and regional public benefit.

Planning to mitigate the impacts of hazard events such as a large-scale regional event will increase the survivability of Redmond's historic landmarks and potential landmarks. One significant strategy to mitigate the impacts of hazards is retrofitting historic properties. Retrofitting will increase the life safety of those who live in, conduct business in, and/or visit historic landmarks. Retrofitting will also increase the survivability of historic properties, reduce the amount of structural debris in transportation arterials, and reduce the impacts to the one-of-a-kind small businesses that are housed in historic properties. Although retrofitting does not guarantee that a building will survive a hazard event, retrofitting can reduce the likelihood of demolition and make repair more economically feasible.

Although the solution to reducing the impacts of hazards is simple - retrofitting - the process to retrofit a historic landmark involves various issues, namely funding, local government support, and public support in order to be successful.

Obtaining funds for retrofitting historic landmarks is competitive. Many fund programs, whether they are sponsored by national, state, county, or private entities, require specific criteria to be met. Many fund programs are contingent upon the landmark designation procedure that a local government develops. Local governments that follow national, state, and county landmark designation procedures will benefit the most by being eligible for a broad range of fund programs. For example, entering into an “Interlocal Agreement” with King County will allow Redmond to take part in the county's fund programs.

Local governments can play a key role in leading retrofitting efforts, not only in applying for retrofitting funds or providing retrofitting incentives for property owners, but also in educating the public of the benefits of retrofitting. One significant benefit, in addition to protecting community character and history, is increasing the resiliency of small businesses that are housed in historic landmarks. These small businesses make up the traditional business district. They also act as a foundation to explore larger historic preservation initiatives such as the National Main Street Program, a program that combines rehabilitation and retrofit of historic landmarks with downtown economic revitalization.

Public support for retrofitting will contribute to Hazard Mitigation Planning; however, building public support may be difficult. Many property owners of historic landmarks have limited funds to retrofit, do not see the community and economic benefits of retrofitting, are fearful of losing their private property rights, and are inundated with the knowledge of undergoing a complex retrofitting project. Those leading a retrofit must take great care in raising the seismic performance of a property while maintaining its historic integrity. Local governments should work to encourage public support, develop public-private partnerships, and decrease the financial and administrative burdens on private property owners. For example, adopting building code flexibility for retrofitting un-reinforced masonry buildings will decrease the burden on retrofitting projects.

Action Items:

1.1 Create an inventory of un-reinforced masonry and wood-frame historic landmarks.

- As a first step to encourage retrofitting, the City should inventory vulnerable historic properties to determine retrofitting needs and prioritize retrofitting projects.
- The City can begin by utilizing the Rapid Screening Procedure developed by FEMA and subsequently conducting a more technical, in-depth inspection of individual buildings.

1.2 Develop incentives to encourage retrofitting. Possible incentives could include:

- Building code flexibility. Pre-hazard retrofit is costly and is unlikely to occur without modified building codes that facilitate economically feasible, incremental improvements in building safety. For example, the Uniform Code for Building Conservation (UCBC) and the State Historic Building Code ". . . attempt to apply different standards for un-reinforced masonry buildings that would improve building safety in California."

Source: Federal Emergency Management Administration and American Planning Association, 1998. Planning for Post-Disaster Recovery and Reconstruction, Chicago, IL: American Planning Association (Page 298-299)

- Property tax relief. King County administers a Special Tax Valuation for Rehabilitated Historic Properties Program. For up to ten years, qualified rehabilitation costs will be subtracted from the total assessed value of the property. Projects such as the Maloney Store in Skykomish, the McGrath Café & Hotel Building in North Bend, and the North Bend Theater were retrofitted in part as a result of special tax valuation. The City of Redmond can take advantage of this program only if the City enters into an "Interlocal Agreement" with King County. See action item 1.6 for further discussion.

Source: June 7, 2002 communication with Kate Krafft, King County Landmarks Program Coordinator and King County Landmark and Heritage Program. Special Tax Valuation for Rehabilitated Historic Properties. Technical Paper No. 42.

- Administer grants for retrofits. The City should pursue fund programs to acquire funds for property owners. See action item 1.6 and 1.7 for possible fund programs.
- Reduce administrative costs. Waive or reduce permitting costs and other administrative fee costs associated with retrofits.
- Provide consultant information and facilitate partnerships. Many property owners do not know where to find information, qualified professionals, etc. to lead retrofits. The City should guide property owners into the retrofitting process by providing a consultant list of qualified engineers approved to retrofit historic buildings. The City should also assist in developing partnerships between consultants and property owners.

1.3 Use hazard scenarios and involve the community in risk assessment. Conduct an economic impact analysis. The analysis will act as a springboard for action.

- Work with the Redmond Chamber of Commerce, small business owners, and property owners to identify the potential losses to small businesses housed in historic landmarks as a result of a disaster.

Source: Federal Emergency Management Administration, 2000. Rebuilding for a More Sustainable Future: An Operational Framework. FEMA Project Impact, Edition 1, November 2000.

- After the February 28 Nisqually Earthquake, a study conducted by Dr. Stephanie Chang, University of Washington, Department of Geography, found that retrofitted historic buildings that housed businesses in south downtown and Pioneer Square remained in business post-disaster versus those businesses that were not housed in retrofitted historic buildings. Refer to Appendix M for copies of a presentation led by Dr. Stephanie Chang.

1.4 Create venues to encourage community participation in retrofitting.

- Organize a community work group focused on brainstorming retrofitting strategies, raising funds, facilitating public-private partnerships, leading education programs or developing informative tools, creating volunteer work committees, and acting as a forum for discussion. Representatives of the work groups should include local government (Redmond Department of Planning & Community Development and Emergency Management), local non-profit organizations (Habitat for Humanity),

Redmond Historical Society, Eastside Heritage Center, Marymoor Museum, and qualified engineers with retrofit experience, etc.

- Use volunteer skill, knowledge, time, and commitment. The work group can organize volunteer non-structural retrofitting parties. Non-structural retrofits involve visiting a small business and helping to secure inventory and other business assets through bolting shelves to walls and securing computers to desks. Enlist the help of Habitat for Humanity to gather materials and volunteers to perform a community effort in limited retrofitting.
- Create methods to partner with large corporations to acquire technical assistance, raise funds, and provide equipment for retrofitting. Many large corporations have access to a wide variety of resources. Encourage large corporations to adopt a historic landmark and sponsor its retrofitting. Develop a “Protect a Historic Jewel” program and capital campaign to encourage sponsorships.
- The City can apply for funds from the Community Development Block Grant to support the work of this community work group. In addition, the community work group can partner with non-profit organizations to raise funds.

1.5 Integrate Hazard Mitigation Planning into other future planning and program efforts such as the Washington State Downtown Revitalization - Main Street Program.

- The Downtown Revitalization Program/Main Street Program administered by the Washington State Office of Community Development and Office of Trade and Economic Development helps communities throughout the state to revitalize the economy, appearance, and image of their traditional business districts. The state provides technical assistance, services, and training to Main Street communities.
- Under the Main Street Program, some business districts create a special assessment district. The special assessment district is a local self-help mechanism that allows businesses and property owners in a defined area to establish self-taxation. These funds may be used for retrofitting. Refer to Port Townsend, WA for an example of Main Street Program participation and coastal Hazard Mitigation Planning. Source: Port Townsend Main Street Program website

  (http://www.ptguide.com/mainstreet/) and Washington State Downtown Revitalization Program website http://www.oted.wa.gov/ed/cea/downtown/index.html)
- Consider linking the community work group (see action item 1.4) to Main Street efforts to incorporate Hazard Mitigation Planning with Main Street initiatives.
- Once implemented, many Main Street sites benefit from funds from private corporations. Consider partnering with Redmond's large corporations to adopt a Main Street landmark.

1.6 Enter into an Interlocal Agreement with King County.

- An Interlocal Agreement will open various funding venues to retrofit historic properties. Under the guises of the agreement, the City of Redmond's landmark designation procedure must follow King County's landmark designation process to become eligible to enter into an agreement.
- One key element in King County's landmark designation process is the "no owner consent" provision. Currently, the City of Redmond's landmark designation process

has an "owner consent" provision. The City will need to either change its current local designation to follow King County's or enter into a partial agreement with King County, thus limiting its ability to be eligible for county funds.

Source: June 7, 2002 communication with Dianna Broadie, Planner, Redmond Department of Planning & Community Development.

- Refer to Penn Central Transportation Co. v. City of New York (1978) 438 U.S. 104, U.S. Supreme Court decision, to obtain background information on the "no owner consent" provision. The background information may be used to support entering into an agreement with King County.

Source: June 7, 2002 communication with Kate Krafft, King County Landmarks Program Coordinator.

1.6a. Pursue funding for retrofitting from King County.
(This action item is contingent upon item 1.6.)

- Landmark Grant Programs
  - Cultural Facilities Program. A cultural organization (either arts or heritage) that owns or uses a King County Landmark is eligible to apply to the Cultural Facilities Program for the purchase, restoration, or rehabilitation of the structure.
  - Landmark Stabilization and Restoration Grant. From time to time, special grant funds are made available for the restoration, stabilization, or rehabilitation of historic properties in King County. In 1993, the King County Council made a special appropriation of $100,000 to stabilize a limited number of endangered county landmarks. In 1995, the Council made $500,000 available as part of an Arts and Heritage Initiative.
- Landmark Restoration Loan Funds. Low-interest loans for restoration projects are available through two programs administered jointly between the Landmarks and Heritage Program, Washington Mutual Bank, and the Valley Community Bank in Duvall. The Landmarks and Heritage Commission reviews proposed loan-funded projects for compliance with restoration and rehabilitation standards, while the banks focus on the financial eligibility of the borrower. Loans are available for the restoration or rehabilitation of privately owned residential properties through Washington Mutual Bank. Loans for restoration and rehabilitation of commercial properties are available through Valley Community Bank. By providing restoration loans at a reduced interest rate, the Landmarks and Heritage Commission assists landmark owners with projects that ensure a longer life for these significant historic resources. Local jurisdictions are also eligible to apply for low-interest loans.

Source: June 7, 2002 communication with Kate Krafft, King County Landmarks Program Coordinator and King County Landmarks and Heritage Program. Incentive Programs for Landmark Owners. Technical Paper No. 26.

1.7 Ensure that historic landmarks located in Redmond's 100-year floodplain participate in the National Flood Insurance Program and pursue funding from the Flood Mitigation Assistance Program for mitigation projects.

- National Flood Insurance Program (NFIP). The purpose of the program is to reduce disaster losses from flooding by providing flood insurance to property owners for structures that otherwise would be uninsurable because of their susceptibility to flooding. Flood insurance underwritten by NFIP is available only in communities that participate in the program.
  - When flood insurance is available for a privately owned structure and flood insurance is not purchased, disaster assistance is not reduced the first time it is requested; however, the disaster assistance applicant must borrow what they would have received from a flood insurance policy. If disaster assistance is requested again and a flood insurance policy has not been executed, disaster assistance is denied.
- Flood Mitigation Assistance Program (FMA). The objective of this program is to reduce the flood hazard to structures that are insurable under NFIP. The FMA is particularly interested in reducing or eliminating repetitive flood insurance loss claims. Grants may be awarded for planning assistance and implementation of mitigation projects. Local jurisdictions can apply for these grants through the Washington State Hazard Mitigation Office.
- Similar to the HMGP, eligible projects include:
  - Existing building retrofits where structures exceed 50 years in age,
  - Acquisition and demolitions/relocations,
  - New construction, and
  - Drainage improvements.

Source: FEMA website (http://www.fema.gov)

Goal 9: Create a Long-Range Recovery Plan for Redmond's Old Town District

Recovery efforts following a major disaster reflect community value choices between competing priorities – returning to normalcy, reducing future vulnerability, and seizing opportunities to improve efficiency, equity, or amenities in the City.

Overview

A recovery plan aims to articulate a community's overall desires in a post-disaster recovery and reconstruction scenario. It provides decision-makers with general guidance as to the policy objectives their decisions must aim to achieve, serves to minimize unintended consequences, and keep the maximum number of stakeholders working together toward the same ultimate goal.

In its Comprehensive Plan, the City of Redmond has documented community values for environmental quality and unique neighborhood urban design characteristics, and promotes sustainable development projects to provide long-term community benefits that have a high environmental and visual quality.

At build-out of the current Plan, the City Center neighborhood is envisioned to be a lively, community gathering place – an urban center with a mix of housing, jobs, shopping, and cultural

activities, as well as a walkable, bikeable center with high capacity transit access. Current use suggests this long-term vision is underway, yet in a major disaster this could be compromised under the pressure of expedience.

OBJECTIVES AND ACTION ITEMS FOR GOAL 9

Objective 1

Ensure recovery planning efforts are consistent with Redmond's values and long-term vision for the Old Town district.

Action Items:

1.1 Develop a post-disaster recovery plan as a sub-element of the Comprehensive Plan and the Mitigation Plan for how Old Town will rebuild following a major event, seeking agreement on process and priorities before the event.

For an outline of recovery plan elements, see Attachment 7 in the Community Process section: Planning for Post-Disaster Recovery, "A Model Recovery and Reconstruction Ordinance."

1.2 Form a task force to develop the plan, assign a lead agency and public official, and identify all stakeholders to provide adequate consideration of all relevant issues.

- Local, State, and Special District officials are needed to address Hazard Mitigation, Emergency Management, City Planning, Transportation, Public Works, Budget and Finance, Legal, Building Safety, Preservation Issues, Solid Waste, Natural Resources, and GIS mapping. Members should include at a minimum:
  - Representatives from the private sector, such as the Chamber of Commerce, utility companies, large employers, and medical facilities.
  - Liaisons with King County, the school board, Red Cross, environmental organizations, social service organizations, and religious or charitable organizations.
  - Representatives from the community at large: neighborhood and homeowner associations, private developers, and contractors.
  - GIS coordination and mapping

Objective 2

Plan proactively to take advantage of post-disaster funding opportunities

Discussion

Outside funding and technical assistance are often available for a limited time following a disaster. Communities that plan and identify a broad framework to direct funding sources will ensure their long-range vision for sustainability.

Action Items:

2.1 Identify resources, timing, and priorities for funding and technical assistance. Develop justification for items and criteria rationale.

- Possible sources of funding include:
  - FEMA Grants,
  - State Emergency Grants,
  - Hazard Mitigation Program Grants, and
  - Low-Interest Small Business Administration (SBA) loans.

Objective 3

Ensure short-term recovery process and related decisions will implement long-term reconstruction goals in the City Center.

Discussion

Historic earthquake recovery case studies identify a range of unintended consequences in the recovery process that can impede successful reconstruction, including:

- Temporary housing often becomes more permanent than originally intended.
- Temporary business locations intended to allow local businesses to operate may become de facto long-term locations.
- Temporary infrastructure provisions.
- Disaster debris dumping and recycling
- Road closures and re-openings.
- Bridge closures and re-openings.
- Restoration of critical infrastructure that might have been suitable for relocation.

Action Items:

3.1 Adopt an interim development moratorium so recovery plan alternatives can be considered, while streamlining repair permits and exempting needs for public health and safety provisions.

3.2 Identify potential properties or sites in or near downtown for temporary housing, business resumption, and debris recycling/dumping, with the awareness that they could remain in place for longer than originally planned.

- Potential receiving sites could include public buildings such as schools and community centers, parks and open space, parking lots, a City-owned right-of-way, or other vacant land.

Objective 4

Seize opportunities for ecological and urban design improvements for Old Town.

Discussion

Redmond's Storm Water Division manages runoff and recharge to protect streams, lakes, and groundwater resources and to prevent flooding and other storm water-related problems. This group reviews almost every proposed development project and initiates storm water construction projects needed to manage runoff and recharge, restore, or enhance stream habitat.

In the current Transportation Planning Program "Connecting Redmond," the Burlington Northern Santa Fe Railroad Right-of-Way is identified as an asset for future recreational trails. With strong public and elected official interest in extending the trail system, this ROW, at 100 feet of vacant land cutting through downtown, offers an attractive design opportunity. When combined with adjacent City land, it provides opportunities for multiple uses.

Design alternatives are in development with consultant team Parsons Brinkerhoff. A variety of trails, gathering places, green spaces, amenities, and uses are being considered.

New development will trigger environmental review and will be subject to the Endangered Species Act, the City's Shoreline Master Program update, and stricter surface/storm water management requirements. Endangered Species Act listings of Chinook salmon and bull trout will contribute to more strict review standards.

When underground utilities are disrupted and require extensive repair, the right-of-way will be under construction and may present an opportunity for street improvements.

Action Items:

4.1 Assess need and consider integrating "Green Infrastructure" design solutions to detain, filter, and/or cool surface runoff in developed areas upstream from the Sammamish River.

- This system could reconnect hydrological functions in the streetscape with a network of landscaped edges, street trees and planters, greenbelt trails, pervious parking surfaces, and pocket parks to handle overflow of the design storm.

4.2 Ensure Recovery Plan is consistent with community and stakeholder desires for the use of the Burlington ROW land, balancing recovery needs and long-term vision. Competing land use needs should be reviewed post-disaster to ensure priorities are met.

- Examples of design prototypes include Seattle Public Utilities' partner projects such as:
  - S.E.A. Street – residential neighborhood near Carkeek Park in North Seattle.
  - West Seattle's Highpoint Community Redevelopment Project, a New Urbanist, multi-family public housing community.

Objective 5

Support business recovery with Main Street Vision and urban design improvements.

Discussion

Old Town's business activity is influenced by urban design strategies. Market forces in rebuilding have been shown to reflect the period before the event but may be exaggerated post event. For redevelopment to be financed, there may be pressure to "upzone" the density, aggregate parcels for larger development, and raise building heights, altering the character and uses of old town.

City Center design regulations aim to shape development in an urban village pattern with small parcels, street-level retail, and building height limits. In a post-disaster recovery scenario, urban design is very closely tied to economic recovery. Thoughtful, quality urban design can support businesses by creating interesting, attractive destinations, supporting specific activities, and conveying a sense of place. In fact, urban design improvements, strategically applied, can generate foot traffic and circulation to support business resumption.

In the current Transportation Planning Program, "Connecting Redmond," future improvements to Redmond Way and Cleveland Street should contribute to and reinforce this area as Redmond's Main Street, which is envisioned as a lively, pedestrian-oriented village with shops, restaurants, and services.

A series of alternatives are being considered for the Redmond Way/Cleveland Street couplet to promote a stronger "main street" image, while also providing for through traffic – facilitated by the City's consulting team, Parsons Brinkerhoff.

Action Items

5.1 Preserve building height limits and any strategic open space by employing existing "Transfer of Development Rights" regulations to shift the density where it best serves the needs of the community, natural resources, and transportation efficiency.

5.2 Actively pursue the vision of Old Town as Redmond's Main Street be encouraging pedestrian uses, character, and activity, and develop specific urban design improvements.

- Implement interpretive signage program along walking and biking routes to enrich local and visitor appreciation and knowledge of natural heritage features, habitat, and cultural history, supporting and stimulating tourism packages.
- Implement design standards for signage, lighting, street trees, street furniture, landscaped medians, and building facades.
- Encourage public art projects to create unique identity and character downtown.
- Clarify and emphasize connections with Town Center, Marymoor Park, Sammamish River, treed areas, open fields, and vistas.
- Clarify and enhance edges of the Old Town district with landscaping planters, street trees, and special paving.

5.3 Evaluate the relocating of public employees to generate more daytime population and/or investigate an anchor tenant, such as a cinema, to stimulate nighttime activity.

CONCLUSION

The goals, objectives and action items presented in this document establish a framework for the City of Redmond to implement both pre- and post-disaster mitigation activities at both the community and the regional level. It recognizes the unique risks and vulnerabilities that face the City of Redmond and its residents. Although the action items were designed with a focus on mitigation, the City is encouraged to pursue both preparedness and response measures whenever mitigation is not feasible.

Many of the action items contained in this document can be undertaken in whole or in part by the City with its own resources. By pursuing regional mitigation initiatives and funding sources whenever possible, the City of Redmond can significantly improve the safety of its communities.

Of all the actions identified in this report, ten priority actions are summarized below. These top ten items were selected based on guidance from City leaders, the effectiveness of the strategy at reducing vulnerability, and the comprehensive mitigation achieved by implementation.

1. Develop alternative emergency government operations capabilities outside of high-risk areas.
2. Partner with King County, neighboring jurisdictions, and WSDOT to harden transportation routes.
3. Strengthen relationships between corporations and vendors, including provisions for Emergency Operations Centers and mutual aid.
4. Reduce risk to the Olympic Pipeline and surrounding areas.
5. Implement neighborhood-targeted risk reduction programs.
6. Design events promoting business continuity.
7. Adopt a post-disaster recovery plan for Old Town.
8. Retrofit historic district structures.
9. Support regional mitigation initiatives.
10. Enhance existing GIS capabilities emphasizing hazard analysis.

These ten items are listed in full as follows, extracted from their respective issue in the text and reproduced here. The University of Washington project team determined ranking from 1 to 10 after the public participation process with City of Redmond officials.

TEN PRIORITY ACTION ITEMS

Priority Action Item 1

Develop alternative emergency government operations capabilities outside of high-risk areas.

This action item is drawn from Goal 1: Community Resiliency to Large-Scale Regional Events. The Objective and Action Items that are relevant to the above priority item are as follows. Numbering refers to their placement in the original Issue Section.

Goal 1, Objective 1

Develop alternative emergency government operations capabilities outside of high-risk areas.

Relevant Action Items:

1.1 Decentralize local government operations.

- The City should attempt to decentralize its local government offices and operations by relocating specific departments to alternative sites throughout the City that are not located in known hazard zones.

1.2 Consider stringent retrofits and protective measures if relocation is not feasible, to ensure that its essential facilities are resilient to multiple types of hazards.

- The resiliency of City facilities should be a top priority in hazards mitigation. The City should utilize the most current design methods to ensure that its facilities are strong enough to withstand a disaster.
- The City should publicize its efforts to decentralize and/or retrofit its facilities as a model to support Redmond's commitment to hazards mitigation.

1.3 Construct an alternative EOC (Emergency Operations Center) outside of the known hazard zone.

- The City should invest in the construction of an additional EOC. The site should be fully equipped and ready to implement in the event that the existing EOC is damaged or inoperable.

Priority Action Item 2

Partner with King County, neighboring jurisdictions, and WSDOT to harden transportation routes.

This action is drawn from Goal 5: Isolation Resulting From Disruption to Lifelines and Infrastructure. The objective and action items that are relevant to the above item are as follows. Numbering refers to their placement in the original Issue Section.

Goal 5, Objective 1

To reduce the disruption to transportation infrastructure from hazard events, Redmond should reduce the vulnerability of transportation infrastructure to hazard events.

Relevant Action Items:

1.1 Cooperate with neighboring jurisdictions, and planning and transportation agencies to harden vulnerabilities of transportation routes. Regional planning should reduce transportation disruption between jurisdictions. The inter-connection of businesses and transportation networks in this region amplifies the effects of disruption of goods and commuters across the region. Adjacent jurisdictions, the county, and the state must coordinate prevention and response to transportation disruption from hazard events on all scales.

- Identify and prioritize regional transportation corridors in order of their respective importance to community and business continuity throughout the region. Focus should be on key interlocal thoroughfares and regional transportation systems. The inter-jurisdictional arterial network represents an important supplement to highway capacity throughout eastside cities.
- Identify and prioritize key vulnerabilities of regional transportation routes. Prioritize the vulnerabilities based on importance of the disrupted route, the scale of the potential disruption, and the effectiveness of mitigation investments.
- Develop a strategy to harden transportation vulnerabilities on a regional basis, based on the prioritization of routes and vulnerabilities. In addition to addressing the hazard and the vulnerability, this may include identifying appropriate responders and establishing detour routes on a regional scale to expedite response to hazard events.
- The extensive research of the Eastside Transportation Partnership to identify regional priority road improvements provides key groundwork for this project. ETP's Mobility Action Priorities has identified regional priority routes and improvements. This action item would add the consideration of roadway vulnerabilities (landslide-prone slopes, frequently-flooded areas, seismic retrofitting, etc.) and disaster-response contingency plans (detour routes and response strategies) to the existing comprehensive analysis that has already been performed.
- The collaborative ETP framework brings together regional leaders of jurisdictions and agencies, and provides a natural framework for further action. The City of Redmond is already engaged in transportation planning efforts in an intra-city and a regional context, and has engaged neighboring jurisdictions and agencies in these efforts.
- Pending entry into a regional planning effort, Redmond may begin by comprehensive analysis and prioritization of vulnerable roadways within their jurisdiction, and contingency planning with detour routes and response strategies.
- Additional contributions of road priority research, road vulnerability research, and existing regional networks may come from Project Impact, Pillars transportation research, King County Transportation Coalition, Seattle Transit Initiative, and Puget Sound Regional Council.

Priority Action Item 3

Strengthen relationships between corporations and vendors, including provisions for Emergency Operations Centers and mutual aid.

This action is drawn from Goal 4: Vulnerability of Large Corporations. The objective and action items that that are relevant to the above item are as follows. Numbering refers to their placement in the original Issue Section.

Goal 4, Objective 1

To facilitate partnerships between large corporations and local small businesses.

Relevant Action Items:

1.4 Encourage large corporations to include their small business vendors and tenant businesses in their emergency management planning.

- As mentioned previously, large corporations benefit from having a variety of resources aimed at strengthening their resiliency to hazard events. Large corporations can share their resources, thereby increasing their economic resiliency in their vendors and tenant businesses through the following suggestions.
  - Include small businesses in training exercises. Many large corporations have office space that mimics the impacts of a hazard event (i.e., broken light fixtures, toppled shelves, etc.) to educate employees on evacuation and search and rescue techniques. Small businesses would benefit from training exercises that large corporations have to offer.
  - Facilitate a mentoring program between large corporations and small businesses. Knowledgeable corporate staff can guide small businesses in the creation of resumption plans, identify appropriate insurance plans, and refer qualified professionals for building retrofits, etc.

1.5 Facilitate cooperative agreements between large corporations and local small businesses in a recovery scenario.

- The City can facilitate partnerships between large corporations and local small businesses by identifying shared risks and opportunities. Large corporations depend on local vendors for production, and local small businesses depend on large corporation contracts for production as well.
- Given the shared risks, the City can facilitate cooperative agreements that result in shared opportunities. Cooperative agreements may be comprised of the following key components.
  - Local small businesses would agree to develop business resumption plans, train employees, and perform structural and non-structural retrofitting to protect their people, assets, and business operations.
  - Large corporations would agree to provide facility space and essential business functions (phone, fax, computer, etc.) during a recovery period so that small businesses can recover quickly.

Priority Action Item 4

Reduce risk to the Olympic Pipeline and surrounding areas.

This item is drawn from Goal 6: Hazards Presented by High-Risk Utilities and Facilities. The objective and action items that are relevant to the above action are as follows. Numbering refers to their placement in the original Issue Section.

Goal 6, Objective 1

To reduce the risk posed by high-risk utilities and facilities, address the vulnerability of these systems.

Relevant Action Items:

1.1 Reduce the risk surrounding an Olympic Pipeline rupture.

- The Olympic Pipeline runs along landslide-prone slopes for much of its length through Redmond. Slopes should be assessed for stability, restoration, re-vegetation needs, and needed drainage improvements. Strict site design, storm water drainage, and vegetation retention standards should be applied to these areas to preserve slope stability. At areas of vulnerability to landslides, sensors triggered by slope movement could provide an early warning system for response. Identify areas where the Olympic Pipeline is exposed above the ground and explore possibilities of burying pipeline.
- Strengthening the structure and integrity of all high-risk utility systems and high-risk facilities may include such measures as:
  - increased frequency of shut-off valves.
  - remotely located control capabilities.
  - structural retrofitting of these high-risk systems.
  - restriction of access.
  - adequate signage along pipelines to prevent accidental disturbance.
  - frequent inspections to ensure compliance with safety/performance standards.
  - relocation to minimize the property and residents vulnerable to these hazards.
- Identify response capabilities. Redmond is working on a response plan to deal with Olympic Pipeline hazard events. The managing company and the City of Redmond have a working relationship. The Redmond Fire Department is trained with regard to shut-off valves and response procedures in the event of disruption to the pipeline. Further coordination of protocols and capabilities may improve response.
- Public education to notify local citizens of the presence of the high-risk utility or facility in their neighborhood may improve the preparation and response by local residents. Education may include detecting warning signs, appropriate contacts in the event of an emergency, site-specific concerns, and evacuation routes.
- Redmond and the Olympic Pipeline Company have information about the location and vulnerabilities of the route. Redmond could perform more extensive analysis of the pipeline route including GIS assessment of parcels, drainages, ownership, and

flow routes, field assessments of vulnerabilities, and work with neighboring jurisdictions on cross-border reduction of vulnerabilities and response.

Priority Action Item 5

Implement neighborhood-targeted risk reduction programs.

This action is drawn from Goal 2: Vulnerability of Single-Family Homes and Home-Based Businesses to a Variety of Hazards. The objectives and action items that are relevant to the above priority item are as follows. Numbering refers to their placement in the original Issue Section.

Goal 2, Objective 1

To reduce the vulnerability of single-family homes in at-risk neighborhoods to a variety of hazards.

Relevant Action Items:

1.1 Implement neighborhood-based risk reduction programs.

Landslides

- Educate homeowners regarding steep slope issues and how to minimize potential for landslides.
  - Topics could include the hazards of dumping fill and debris at the head of a steep slope, erosion control landscaping, and storm water drainage problems.
  - This could be addressed and coordinated by the Public Works Department.

Earthquakes and Ground Shaking

- Promote technical assistance information programs such as the Project Impact Home Retrofit Program, for homeowners addressing items such as seismic strengthening of homes, and non-structural retrofitting.
  - To promote and help education of homeowners, the City could hire an intern from a local high school to canvas at-risk homes and neighborhoods with information regarding the Home Retrofit Program. The City and the Building Department would prepare the information to distribute to homeowners.
  - Libraries, insurance companies, and realtors can also be used as a means to provide information.
  - Availability of private sponsors and organizations should also be investigated to provide motivation and encourage the availability of a tool lending library that gives approximate numbers and costs of certain types of retrofitting.
  - The Project Impact training should include non-structural retrofit training as well as information for structural retrofits.
- Provide financial incentives for retrofitting for neighborhoods at highest risk.

- Consider applying for home and home-based business retrofitting assistance through the Hazard Mitigation Grant Program. (Refer to Historical and Cultural Resource Section).

Winter Storms

- Host public education workshops for single-family homeowners regarding vulnerabilities to winter storms.
  - Issues to discuss could include tree management and how residents handle short-term isolation such as creation and maintenance of an isolation kit containing food and water for 72 hours.

Wildland Interface Fires

- Implement public fire safety programs that disseminate fire safety information to the public, especially in times of increased vulnerability.
  - Efforts can address types of combustible roof coverings, fire safe construction techniques for fire hazard areas, and importance of clearing brush from around homes.
  - The City and Fire Department can coordinate programs like this.
  - Information should be provided to those homes located in isolated fire hazard areas in Redmond and available at the Fire Department for interested individuals in times of increased vulnerability and drought conditions.
- Encourage fire resistant landscaping techniques within the City of Redmond.
  - The City, in coordination with the Fire Department, should hold forums on fire resistant planting and encourage the development of defensible space around homes.

Priority Action Item 6

Design events promoting business continuity.

This action item is drawn from Goal 3: Vulnerability of Small Businesses. The objective and action items that are relevant to the above priority are as follows. Numbering refers to their placement in the original Issue Section.

Goal 3, Objective 1

To ensure survivability and expedite business resumption following a disaster.

Relevant Action Items:

1.1 Design events to promote business continuity.

- The Chamber of Commerce and small business organizations working with other eastside cities to share costs of work and address inter-jurisdictional Issues could coordinate this.

- Specific educational topics should include preparation for short-term business disruptions and contingency plans for emergency situations.
- Relevant information includes structural improvements (redundancy in communications systems, generators) as well as improving functional connection and recovery between businesses that rely heavily upon one another for function.

Priority Action Item 7

Adopt a post-disaster Recovery Plan for Old Town.

This action item is drawn from Goal 9: Long-Range Recovery of Redmond's Old Town District. The objective and action items that are relevant to the above priority action items are as follows. Numbering refers to their placement in the original Issue Section.

Goal 9, Objective 1

Ensure recovery efforts are consistent with Redmond's values and long-term vision for the Old Town district.

Relevant Action Items:

1.1 Develop a post-disaster recovery plan as a sub-element of the Comprehensive Plan or Mitigation Plan for how Old Town will rebuild following a major event, seeking agreement on process and priorities before the event.

- For an outline of recovery plan elements, see Appendix L: Planning for Post-Disaster Recovery, "A Model Recovery and Reconstruction Ordinance," pp 149-167.

1.2 Form a task force to develop the plan, assign a lead agency and public official, and identify all stakeholders to provide adequate consideration of all relevant issues.

- Local, State, and Special District Officials are needed to address Hazard Mitigation, Emergency Management, City Planning, Transportation, Public Works, Budget and Finance, Legal, Building Safety, Preservation Issues, Solid Waste, Natural Resources, and GIS mapping. Members should include at a minimum:
  - Representatives from the private sector, such as the Chamber of Commerce, utility companies, large employers, and medical facilities.
  - Liaisons with King County, the school board, Red Cross, environmental organizations, social service organizations, and religious or charitable organizations.
  - Representatives from the community at large: neighborhood and homeowner associations, private developers, and contractors.
  - GIS coordination and mapping

Priority Action Item 8

Retrofit historic district structures.

This action item is drawn from Goal 8: Vulnerability of Historic and Cultural Resources. The objective and action items that are relevant to the above priority action are as follows. Numbering refers to their placement in the original Issue Section.

Goal 8, Objective 1

Retrofit designated historic landmarks.

Relevant Action Items:

1.1 Create an inventory of un-reinforced masonry and wood-frame historic landmarks.

- As a first step to encourage retrofitting, the City should inventory vulnerable historic properties to determine retrofitting needs and prioritize retrofitting projects.
- The City can begin by utilizing the Rapid Screening Procedure developed by FEMA and subsequently conducting a more technical, in-depth inspection of individual buildings.

1.2 Develop incentives to encourage retrofitting. Possible incentives could include:

- Building code flexibility. Pre-hazard retrofit is costly and is unlikely to occur without modified building codes that facilitate economically feasible, incremental improvements in building safety. For example, the Uniform Code for Building Conservation (UCBC) and the State Historic Building Code " . . . attempt to apply different standards for un-reinforced masonry buildings that would improve building safety in California."

Source: Federal Emergency Management Administration and American Planning Association, 1998. Planning for Post-Disaster Recovery and Reconstruction, Chicago, IL: American Planning Association, (Page 298-299).

- Property tax relief. King County administers a Special Tax Valuation for Rehabilitated Historic Properties Program. For up to ten years, qualified rehabilitation costs will be subtracted from the total assessed value of the property. Projects such as the Maloney Store in Skykomish, the McGrath Café & Hotel Building in North Bend, and the North Bend Theater were retrofitted in part as a result of special tax valuation. The City of Redmond can take advantage of this program only if the City enters into an Interlocal Agreement with King County. See action item 1.6 for further discussion.

Source: June 7, 2002 communication with Kate Krafft, King County Landmarks Program Coordinator and King County Landmark and Heritage Program. Special Tax Valuation for Rehabilitated Historic Properties. Technical Paper No. 42.

- Administer grants for retrofits. The City should pursue fund programs to acquire funds for property owners. See action item 1.6 and 1.7 for possible fund programs.

- Reduce administrative costs. Waive or reduce permitting costs and other administrative fee costs associated with retrofits.
- Provide consultant information and facilitate partnerships. Many property owners do not know where to find information, qualified professionals, etc. to lead retrofits. The City should guide property owners into the retrofitting process by providing a consultant list of qualified engineers approved to retrofit historic buildings. The City should also assist in developing partnerships between consultants and property owners.

Priority Action Item 9

Support regional mitigation initiatives.

This action item is drawn from Goal 1: Community Resiliency to Large-Scale Regional Events. The objective and action items that are relevant to the above priority action item are as follows. Numbering refers to their placement in the original Issue Section.

Goal 1, Objective 4

Support a region-based focus on mitigation and sustainability through working with neighboring cities and the county in strengthening public education and outreach programs.

Relevant Action items:

4.1 Increase public awareness and preparedness by developing a series of regionally available public workshops or seminars to educate homeowners and local businesses on earthquake-resilient practices.

- The City, in cooperation with neighboring cities and the county, should develop a series of seminars focusing on disaster preparedness, community resiliency, and mitigation, and continue to utilize its local schools as conference centers for hosting these workshops.
- The City, in cooperation with the county, should supplement the existing school-based preparedness programs with after-school programs geared towards students' parents. Having the seminars in the evening and encouraging parents to participate would result in safer homes and communities.

4.2 Increase community recovery capabilities by creating a system whereby local residents and businesses can immediately submit damage information to responders and the proper authorities.

- Rapid submittal of damage estimates is essential following a disaster and should be a high priority for local residents. The disaster information center (refer to objectives 2, action item 2.2) could provide a convenient means of submitting this information digitally.
- The City could consult with the USGS and the National Weather Service to determine how to best approach this type of program. The USGS utilized its web-based capabilities to gather earthquake information from citizens through its Earthquake Hazards Program's "earthquake reporting website." The National Weather Service radio is becoming an all-hazards service.

Priority Action Item 10

Enhance existing GIS capabilities emphasizing hazard analysis.

This item is drawn from Goal 1: Community Resiliency to Large-Scale Regional Events. The objective and action items that are relevant to the above priority action item are as follows. Numbering refers to their placement in the original Issue Section.

Goal 1, Objective 5

Identify and protect critical facilities in the City of Redmond.

Relevant Action Items:

5.2 Continue hazards mapping efforts and distribute data to local officials as it develops to enhance incorporation of mitigation into Land Use Planning.

- The City's GIS Department should seek to establish and/or strengthen relationships with other jurisdictions, consultants, and academia, to ensure that maps are as up-to-date as possible, and that local planners have the best available information.

The primary focus of this document is mitigation, which is "any sustained action that reduces or eliminates long-term risk to people and property from natural hazards and their effects." We are focusing on goals and objectives that reduce the level of risk where possible, thereby limiting the need for preparedness. Where mitigation is not feasible or until an acceptable level of mitigation can be achieved, the document offers action items focused on preparedness and response. Action items were established that seek to address each goal individually. These actions were driven by the goals, objectives and visions stated in the City of Redmond Comprehensive Plan, and they are consistent with those statements. The document supports the capitalization on the opportunities presented following a disaster

The City's willingness to participate in this project and its commitment to Hazard Mitigation illustrates Redmond's goals of safer, more resilient communities. Through this project, the City has established a strong relationship with the University of Washington.

Many people from varying backgrounds contributed to the information contained in this document. City Officials, Planners, Law Enforcement and Fire Personnel, local residents, business owners, and University of Washington project staff all provided input that was essential to the development of this Plan.

PRIORITIZATION PROCESS

Of all the actions identified in this report, ten priority items are summarized below. These top ten action items were selected based on guidance from City leaders, the effectiveness of the strategy at reducing vulnerability, the comprehensive mitigation achieved by implementation and a benefit cost review of the proposed mitigation item.

The following matrix offers specific information on when the items will be implemented and which City Agency is charged with responsibility for that item.

***Further Analysis Requirements**:*

This Hazards Mitigation Plan and the City of Redmond acknowledge that these action items have not gone through a rigorous and detailed environmental, historic or benefit to cost analyses. Although such considerations played a role in the prioritization of these action items, largely through the development of the probable scenarios, further analyses will be undertaken before these action items become scheduled for implementation.

SEPA, Historic Preservation Act, and benefit to cost requirements and guidance will be met by the City of Redmond. Also, the City of Redmond will take advantage of the newly developed benefit to cost software made available by FEMA before project implementation.

Matrix for Prioritization of the Top 10 Action Items

	Action Item	Lead Agency	Time Frame	Funding Source
1	Identify alternative emergency government operations capability outside of high-risk areas.	Emergency Management / Police / Fire	1 to 3 years	General Fund
2	Partner with King County, neighboring jurisdictions, and WSDOT to harden transportation routes.	Public Works	1 to 5 years	CIP Funds
3	Strengthen relationships between corporations and vendors, including provisions for EOC's and mutual aid.	Emergency Management	1 to 3 years	Emergency Management / Grant Funds
4	Reduce risk to the Olympic Pipeline and surrounding areas.	Planning / Fire	1 year	General Fund
5	Implement neighborhood-targeted risk reduction programs.	Planning / Emergency Management	1 to 5 years	General Fund / Grant Funds
6	Design events promoting business continuity.	Planning / Emergency Management	1 to 2 years	General Fund / Grant Funds
7	Adopt a post-disaster Recovery Plan for Old Town.	Planning	1 to 4 years	General Funds
8	Retrofit Historic District structures.	Planning / Emergency Management	3 to 10 years	Grant Funds

9	Support regional mitigation initiatives.	Emergency Management	1 to 3 years	Emergency Management
10	Enhance existing GIS capabilities emphasizing hazard analysis.	Fire / IS	1 to 5 years	General Fund

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